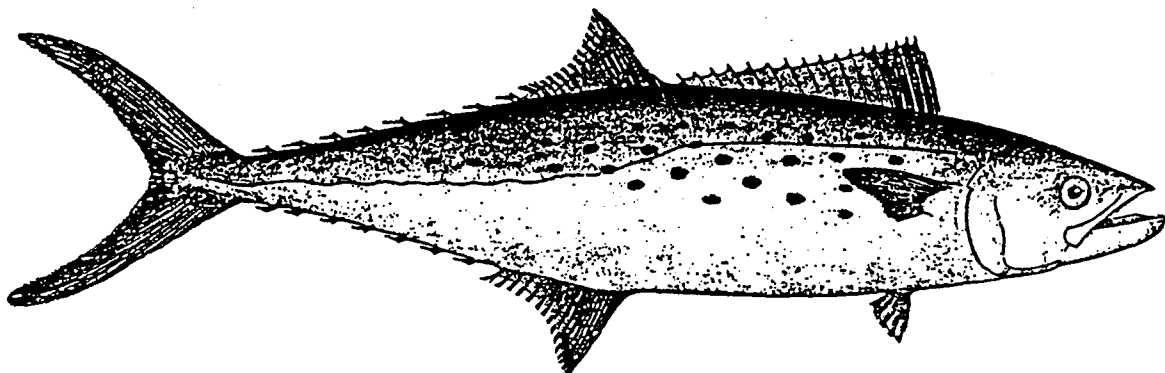
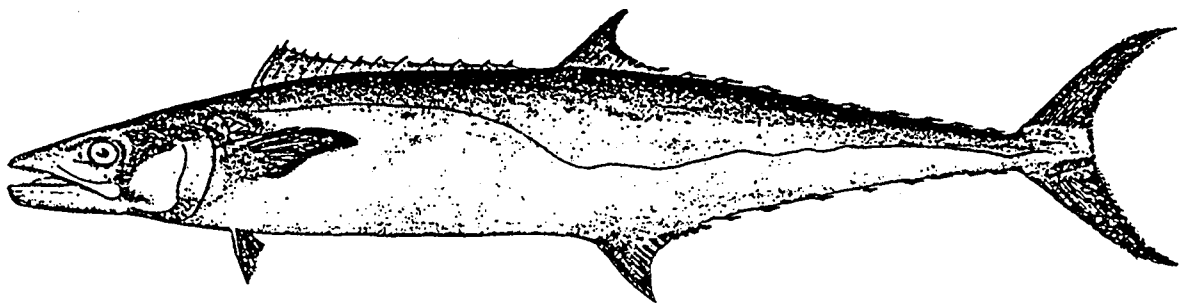


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Chesapeake Bay and Atlantic Coast King and Spanish Mackerel Fishery Management Plan



Agreement Commitment Report 1994



Chesapeake Bay Program

Chesapeake Bay and Atlantic Coast King and Spanish Mackerel Fishery Management Plan

Agreement Commitment Report



October 1994

Edited By Lewis Gillingham and Tom O'Connell

Printed by the U.S. Environmental Protection Agency for the Chesapeake Bay Program

Adoption Statement

We, the undersigned, adopt the *1994 Chesapeake Bay & Atlantic Coast King & Spanish Mackerel Management Plan*. The Plan is in fulfillment of the 1987 Chesapeake Bay Agreement to develop and adopt a series of baywide fishery management plans for commercially, recreationally, and selected ecologically valuable species.

We agree to accept the 1994 King & Spanish Mackerel Management Plan as a guide to enhancing and protecting king and Spanish mackerel resources for long-term ecological, economic and social benefits. We further agree to work together to implement, by the dates set forth in the Plan, the management actions recommended to address stock status, monitoring of catch and quotas, research needs, waste/sublegal bycatch, hook and release mortalities, and habitat degradation.

We recognize the need to commit long-term, stable, financial support and human resources to the task of managing king and Spanish mackerel stocks. In addition, we direct the Living Resources Subcommittee to periodically review and update the Plan and report on progress made in achieving the Plan's management recommendations.

Signatures

Date October 14, 1994

For the Commonwealth of Virginia

George F. Allen

For the State of Maryland

William James Schaefer

For the Commonwealth of Pennsylvania

Robert Plasey

For the United States of America

William E. Brown

For the District of Columbia

Donna V. Kelly

For the Chesapeake Bay Commission

Elmer E. Cross, Jr.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES.....	i
ACKNOWLEDGEMENTS.....	ii
EXECUTIVE SUMMARY.....	iii
THE FISHERY MANAGEMENT PLAN PROCESS.....	v
SECTION 1. BACKGROUND.....	1
Biological Background.....	1
King Mackerel.....	1
Spanish Mackerel.....	2
Biological Profile.....	3
Habitat Issues.....	6
Fisheries.....	7
King Mackerel.....	7
Spanish Mackerel.....	8
Fishery Parameters.....	10
Resource Status.....	12
King Mackerel.....	13
Spanish Mackerel.....	13
Current Laws and Regulations.....	14
Status of Traditional Fishery Management Approaches.....	16
Research Needs.....	17
References.....	18
SECTION 2. King and Spanish Mackerel Management.....	32
Fishery Management Plan: Status and Management Unit.....	32
A. Goal Statement and Objectives.....	33
B. Problems Areas and Management Strategies.....	33
1. Stock Status.....	33
2. Monitoring Catch and Quotas, and Research Needs.....	35
3. Waste/Sublegal Bycatch and Hook and Release Mortalities.....	35
4. Habitat Issues.....	36
C. Implementation Matrix.....	38

LIST OF TABLES AND FIGURES

Tables

1. Schedule For Reviewing Fishery Management Plans.....	vii
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Figures

1. Virginia Commercial King Mackerel Landings By Year.....	21
2. Virginia Commercial King Mackerel Landings By Gear.....	22
3. Virginia Commercial King Mackerel Landings By Area.....	23
4. Virginia Commercial King Mackerel Landings By Area and Year.....	24
5. Maryland Commercial King and Spanish Mackerel Landings By Year.....	25
6. Maryland Spanish Mackerel Commercial Landings and Dockside Value By Year.....	26
7. Virginia King Mackerel Citations by Year.....	27
8. Virginia Commercial Spanish Mackerel Landings By Year.....	28
9. Virginia Commercial Spanish Mackerel Landings By Gear.....	29
10. Virginia Commercial Spanish Mackerel Landings By Area....	30
11. Virginia Commercial Spanish Mackerel Landings By Area and Year.....	31

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Members of the Fisheries Management Workgroup were:

Mr. K.A. Carpenter, Potomac River Fisheries Commission
Mr. James O. Drummond, Maryland citizen representative
Mr. William Goldsborough, Chesapeake Bay Foundation
Dr. Edward Houde, UMCEES/Chesapeake Biological Laboratory
Mr. W. Pete Jensen, Chair, Maryland Department of Natural Resources
Dr. R. Jesien, Horn Point Environmental Lab
Dr. Ron Klauda, MDNR, Chesapeake Bay Research and Monitoring
Ms. Anne Lange, NOAA Chesapeake Bay Office
Mr. Richard Novotny, Maryland Saltwater Sportfishermen's Assoc.
Mr. Ed O'Brien, Maryland Charter Boat Association
Mr. Ira Palmer, D.C. Department of Consumer and Regulatory Affairs
Mr. Larry Simms, Maryland Watermen's Association
Mr. Jack Travelstead, Virginia Marine Resources Commission
Ms. Mary Roe Walkup, Citizen's Advisory Committee
Col. Franklin I. Wood, MDNR Natural Resources Police

Staff to the Fisheries Management Workgroup were:

Ms. Nancy Butowski, MDNR
Ms. Sonya Davis, VMRC
Mr. Lewis Gillingham, VMRC
Mr. Roy Insley, VMRC
Mr. Thomas O'Connell, MDNR
Mr. Harley Speir, MDNR

EXECUTIVE SUMMARY

Introduction

One of the strategies for implementing the Living Resources Commitments of the 1987 Chesapeake Bay Agreement is to develop and adopt a series of baywide fishery management plans (FMPs) for commercially, recreationally, and selected ecologically valuable species. The FMPs are to be implemented by the Commonwealth of Pennsylvania, Commonwealth of Virginia, District of Columbia, Potomac River Fisheries Commission, and State of Maryland as appropriate. The original FMP development schedule was amended to include king and Spanish mackerel with a completion date of 1994. The King and Spanish Mackerel FMP was drafted by staff from the Maryland Department of Natural Resources (MDNR) with support from the Virginia Marine Resources Commission (VMRC) staff. A FMP workgroup consisting of members from government agencies, the academic community, the fishing industry and public interest groups reviewed and commented on the plan. The management plan contains a summary of the fishery under consideration, a discussion of problems and issues that have arisen, and recommended management actions.

Goal and Objectives

The goal of the King and Spanish Mackerel Fishery Management Plan is:

Enhance and perpetuate king and Spanish mackerel stocks in the Chesapeake Bay and its tributaries, and throughout their Atlantic coast range, so as to generate optimum long-term ecological, social and economic benefits from their commercial and recreational harvest and utilization over time.

In order to meet this goal, a number of objectives must be met. These objectives are incorporated into the areas of concern and management strategies summarized below.

Areas of Concern and Management Strategies

Stock Status: King and Spanish mackerel stocks are currently managed under the Coastal Pelagics FMP and by individual states. Recent stock assessments indicate that management measures in the South Atlantic have been effective in rebuilding stocks. Mackerel stocks have been expanding their range and increasing in abundance in areas where they historically occurred but had declined or disappeared. To continue the efforts put forth by the SAFMC compatible and coordinated interjurisdictional management is essential. The states will adopt size and creel limits consistent with the recommendations of the South Atlantic Fishery Management

Council (SAFMC) and in effect in Federal waters. In addition, Maryland and Virginia will close their respective king and Spanish mackerel recreational and commercial fisheries when such closures are in effect in Federal waters.

Monitoring Catch and Quotas, and Research Needs: The Coastal Pelagics FMP manages King and Spanish mackerel stocks through a quota. In order for this approach to succeed, cooperative interstate research and comprehensive monitoring are essential. The states will track the commercial and recreational harvest of king and Spanish mackerel, provide such information to the SAFMC on a timely basis and support research needs.

Waste/Sublegal Bycatch and Hook and Release Mortalities: King and Spanish mackerel are delicate fish that handle poorly and do not survive long out of the water. Commercial fishermen catch sublegal Spanish mackerel, and occasionally king mackerel in commercial gear set for mixed species. Recreational fishermen catch and release king and Spanish mackerel when they are under size or their bag limit has been reached. The states will investigate means of reducing undersized bycatch in the commercial fisheries and hook and release mortalities in the recreational fisheries.

Habitat Issues: Increasing urbanization and industrial development of the Atlantic coastal plain has led to a decrease in the environmental quality of many estuarine communities. Estuarine habitat loss and degradation in the Chesapeake Bay may have adverse effects on king and Spanish mackerel stocks. The jurisdictions will continue to refine their water quality and habitat programs to improve the environmental quality of the Bay.

THE FISHERY MANAGEMENT PLAN PROCESS

What is a fishery management plan?

A Chesapeake Bay fishery management plan provides a framework for the Bay jurisdictions to take compatible, coordinated management measures to conserve and utilize a fishery resource. A management plan includes pertinent background information, management strategies, recommended actions, and an implementation date.

A fishery management plan is not an endpoint in the management of a fishery but part of a dynamic, changing process consisting of several steps. The first step consists of analyzing the complex biological, economic and social aspects of a particular finfish or shellfish fishery. The second step includes defining the concerns of a fishery, identifying potential solutions, and choosing appropriate management strategies. Once specific goals have been defined, it is important to measure progress towards meeting the goals, establish accountability and engage the general public. Plans must be adaptive and flexible to meet the changing needs of a particular resource. They are annually reviewed and updated in order to respond to the most current information on the fishery.

Management Plan Background

As part of the 1987 Chesapeake Bay Agreement's commitment to protect and manage the natural resources of the Chesapeake Bay, the Bay jurisdictions developed a series of fishery management plans for commercially, recreationally, and selected ecologically valuable species. A comprehensive and coordinated approach by the various local, state and federal groups in the Chesapeake Bay watershed is necessary for successful fishery management. Bay fisheries are traditionally managed separately by Pennsylvania, Maryland, Virginia, the District of Columbia, and the Potomac River Fisheries Commission. There is also a federal Mid-Atlantic Fishery Management Council (MAFMC) which has management jurisdiction for offshore fisheries (3-200 miles), and a coastwide organization, the Atlantic States Marine Fisheries Commission (ASMFC), which coordinates the management of migratory species in state waters (internal waters to 3 miles offshore) from Maine to Florida.

A Fisheries Management Workgroup, under the auspices of the Chesapeake Bay Program's Living Resources Subcommittee, was formed to develop baywide fishery management plans. The workgroup's members represent fishery management agencies from the District of Columbia, Maryland, Pennsylvania, the Potomac River Fisheries Commission, Virginia, and the federal government; the Bay area academic community; the fishing industry; conservation groups; and interested citizens. Establishing Chesapeake Bay FMPs, in addition

to coastal FMPs, creates a forum to specifically address problems that are unique to the Chesapeake Bay. They also serve as the basis for implementing regulations in the Bay jurisdictions.

The Chesapeake Bay Program's Fishery Management Planning Process

The planning process starts with initial input by the Fisheries Management Workgroup and development of a draft plan. This is followed by a review of the management proposals by Bay Program committees, other scientists and resource managers, and the public. Comments are incorporated into a final draft of the management plan. It is endorsed by the Chesapeake Bay Program's Living Resources Subcommittee (LRSC), the Implementation Committee (IC), and the Principal Staff Committee (PSC). The plan is sent to the Executive Committee (EC) for adoption.

Upon adoption by the EC, the appropriate management agencies implement the plan. In 1990, the Maryland legislature approved Section 4-215 of the Natural Resource Article giving the Maryland Department of Natural Resources authority to regulate a fishery once a FMP has been adopted by regulation. In Virginia, FMP recommendations are pursued either by legislative changes or through a public regulatory process conducted by the Commission. A periodic review of each FMP is conducted by the Fisheries Management Workgroup to incorporate new information and to update management strategies as needed.

The first group of fishery management plans was completed in 1989. Additional plans have been completed each year encompassing 16 finfish and shellfish species. With time and changes, it became apparent that a substantive review of each FMP at regular intervals would be necessary. The FMP workgroup developed a review schedule to upgrade each plan (Table 1). The revised FMP must be sent through the regular Chesapeake Bay Program's fishery management planning and adoption process. Since the major review schedule extends over a 5-year period, important minor changes are addressed through an amendment procedure. This entails developing a description of the proposed changes and sending it through the FMP workgroup for endorsement. The amendment must be published for public comment and reviewed by the LRSC and the IC for their comment and approval. The PSC has been given authority by the EC to approve amendment changes.

Table 1. Schedule for reviewing fishery management plans

SPECIES	ADOPTION DATE	REVIEW DATE
Shad/Herring	1989	June 1995
Blue Crab	1989	1994
Oysters	1989	1994
Striped Bass	1989	August 1995
Weakfish/Seatrout	1990	March 1996
Bluefish	1990	June 1995
Croaker/Spot	1991	1996
American Eel	1991	1996
Summer Flounder	1991	March 1996
Black Drum Red Drum	1993 1993	1997
Catfish	July 1995	2000
Mackerel	1994	1998
Black Sea Bass	July 1995	2000
Tautog	December 1995	2000
Horseshoe Crabs	1994	1999

Section 1. BACKGROUND

BIOLOGICAL BACKGROUND

The king mackerel, Scomberomorus cavalla, and Spanish mackerel, Scomberomorus maculatus are members of the mackerel family, Scombridae. Both species support major commercial and sport fisheries along the Atlantic Ocean and Gulf of Mexico (NMFS 1990).

King Mackerel

King mackerel inhabit coastal waters from the Gulf of Maine to Rio de Janeiro, Brazil, including the Gulf of Mexico (GMFMC, SAFMC 1985). They are most commonly found from the Chesapeake Bay southward. Adult king mackerel are pelagic and tend to be solitary while immature fish school, sometimes mixing with schools of Spanish mackerel of similar sizes (GMFMC, SAFMC 1985). Tagging studies indicate king mackerel are migratory (Powers and Eldridge 1983). Migratory patterns occur in response to water temperature with 68° F (20° C) considered the species minimum preferred temperature (Williams and Taylor 1986). Migratory behavior changes with increasing size and age of king mackerel (Beaumariage 1973). Large king mackerel migrate to a greater extent than smaller, immature individuals (Williams, unpub. man., 1977).

Two genetic stocks of king mackerel have been identified from allozyme frequency data. One that occurs along the western Atlantic coast and up the western coast of Florida (Atlantic Stock), and the other is in the western Gulf (Western Gulf Stock) (Mackerel Stock Assessment Panel 1994). The present management regime recognizes two migratory groups of king mackerel based on tagging data and growth rate differences, the Atlantic migratory group and the Gulf migratory group, although fish captured in the eastern Gulf of Mexico off west Florida are genetically indistinguishable from the Atlantic genetic stock.

The king mackerel Atlantic migratory group generally moves southward, along the Atlantic coast in the fall, overwintering off northeast Florida. During severely cold winters some mixing with the Gulf group occurs south of Cape Canaveral. In spring, most of these fish move northward to the northern part of their distribution and are concentrated off the coast of the Carolinas in the spring, summer and fall. Others remain behind and support a summer fishery in southern Florida (Powers and Eldridge 1983).

King mackerel from the Gulf migratory group winter off southeast Florida and Louisiana. Those wintering off southeast Florida support a winter fishery (Powers and Eldridge 1983). In April and May, these fish migrate through the Florida Keys and up

into the Gulf of Mexico. Most of these fish are concentrated in the northern Gulf of Mexico from Texas to northwest Florida in May through September. Some smaller, immature individuals remain off southwest Florida in the summer.

King mackerel exhibit protracted spawning with several spawning peaks (Beaumariage 1973). Along the Florida west coast spawning occurs from April through November with a peak in May (Beaumariage 1973). On the Atlantic coast, larvae have been collected from May through October. Larval distribution indicates spawning occurs in the western Atlantic off the Carolinas, Cape Canaveral and Miami (Wollam 1970, Schekter 1971 and Mayo 1973). There does not appear to be a well defined area for spawning.

Spanish mackerel

Spanish mackerel inhabit coastal waters of the western Atlantic Ocean from the Gulf of Maine to the Yucatan Peninsula (Collette et al. 1978). They are schooling fish, which prefer neritic coastal waters but freely enter tidal estuaries. Spanish mackerel are most frequently found in water temperatures between 70 and 88° F (21 and 31° C), rarely below 64° F. While the stock structure of Spanish mackerel is poorly known, there is some evidence from electrophoretic analysis of separate Gulf and South Atlantic groups with a mixing zone off south Florida (Skow and Chittenden 1981). Two groups of Spanish mackerel have also been delineated based on distributional patterns, spawning areas and the history of exploitation. Based on this information the two groups are divided by the Dade/Monroe County line in south Florida to facilitate management (GMFMC, SAFMC 1987).

The Atlantic migratory group of Spanish mackerel makes seasonal migrations along the Atlantic coast and appears to be much more abundant in Florida during the winter. They move northward each spring and occur off the Carolinas by April or May, off Chesapeake Bay by May or June, and some years, as far north as Narragansett Bay by July (Berrien and Finan 1977). Results of tagging studies in North Carolina have confirmed a southern movement to Florida in the winter and movement north to Virginia in the summer and fall (Phalen 1989).

Members of the Gulf migratory group move southward in the fall, from the northern and eastern Gulf coast and appear abundant off south Florida in the winter. In the spring, they migrate west of Cape San Blas. 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, which was returned from Vera Cruz, Mexico (GMFMC, SAFMC 1985).

Spanish mackerel spawning is also protracted, occurring from April through September (Powell 1975). The onset of spawning

into the Gulf of Mexico. Most of these fish are concentrated in the northern Gulf of Mexico from Texas to northwest Florida in May through September. Some smaller, immature individuals remain off southwest Florida in the summer.

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progresses from south to north. In the Gulf of Mexico, larvae have been found widely distributed from the west coast of Florida to south Texas (Wollam 1970; Dwinell and Futch 1973; McEachran and Finucane 1979). Along the Atlantic coast, spawning begins in April in the Carolinas, in mid-June in the Chesapeake Bay and from late August to late September off Sandy Hook, New Jersey (Earll 1883; Beaumariage 1970). Larvae have been collected from May through mid-September from Cape Fear, North Carolina to Cape Canaveral, Florida (Dwinell and Futch 1973). Spanish mackerel spawning area is widely distributed but spawn much closer to shore and in more shallow water than king mackerel (Dwinell and Futch 1973; McEachran and Finucane 1979).

BIOLOGICAL PROFILE

Fecundity

King mackerel: An age XIII, 56 lb. (25.6 kg) female held 12,207,000 eggs while an age I, 1.5 lb. (0.68 kg) female had 69,000. The best indicator of fecundity is the total weight of the fish.

Spanish mackerel: Egg number estimates for females ranging from 12 to 26 inches FL (312 to 664 mm) ranged from 100,000 for a 13 inch FL (328 mm, 0.30 kg) female to 2,113,000 for a 25 inch FL (626 mm, 2.4 kg) female (Finucane and Collins 1986). A 6 lb. (2.7 kg) female collected from the Chesapeake Bay contained an estimated 1.5 million eggs (Earll 1883).

Age/Size At Maturity

King mackerel: In south Florida, major spawning activity occurs at age IV (34 inches FL (857mm)) and over in females and age III (28 inches FL (705mm)) and over in males, although age III females and age II males are reproductively active (Beaumariage 1973).

Spanish mackerel: Become sexually mature in their second and third year of life (age I and II) when 10 to 14 inches FL (250 to 350 mm), although age III and older individuals constitute the bulk of the spawning stock.

Longevity

King mackerel: Females live longer than males, to a

maximum age of XIV years or older.

Spanish mackerel: Life span may exceed X years.

Spawning and Larval Development

Spawning Season

King mackerel: Spawning is protracted. Larvae were collected from May through October on the Atlantic coast.

Spanish mackerel: Spawning is protracted, occurring from April to October (Finucane and Collins 1986; Collins and Stender 1987). Spawning begins in mid-June in the Chesapeake Bay region.

Spawning Area

King mackerel: Spawning occurs over the middle to outer continental shelf waters of the Gulf of Mexico and South Atlantic Ocean. There does not appear to be a well defined area of spawning.

Spanish mackerel: Spawning occurs over the inner continental shelf, over a widely distributed area. Larvae were found along the Atlantic coast from Cape Canaveral, Florida to Cape Hatteras, North Carolina (Collins and Stenger 1987). Larval abundance was greatest in the eastern Gulf of Mexico, and distributed to the Texas coast (McEachran and Finucane 1979). Spanish mackerel supposedly spawn in the Atlantic off the coast of North Carolina and Virginia, however the only published evidence of this are early larvae collections by Earll (1883) and Ryder (1887).

Range

King mackerel: Western Atlantic off the Carolinas, Gulf of Mexico down to the Dry Tortugas.

Spanish mackerel: Perhaps as far north as Delaware Bay, down to south Florida.

Salinity

King mackerel: 25-35 ppt

Spanish mackerel: 30-35 ppt

Temperature

King mackerel: Spawn above 77° F (25° C).

Spanish mackerel: Spawn above 77° F (25° C).

Young-of-Year-Juveniles

Location

King mackerel: Juveniles were found off southwest Florida in May, in the Yucatan Channel in June and July, off East Florida and in northern Gulf of Mexico in September, and off Cape Hatteras, North Carolina in August, September and November (Wollam 1970).

Spanish mackerel: Primarily utilize nearshore ocean waters but commonly use estuaries as nursery grounds.

Salinity

King mackerel: 26-34 ppt

Spanish mackerel: 13-34 ppt

Temperature

King mackerel: 72-82° F (22-28° C)

Spanish mackerel: no data available

Subadults and Adults

Location

King mackerel: From the Continental Shelf shoreward, occasionally moving into estuarine waters. Schools congregate in areas of bottom relief, and older, solitary individuals are found around structure.

Spanish mackerel: From the inner shelf shoreward, and are common in the lower portions of large, high salinity estuaries within their range.

Salinity

King mackerel: 20-35 ppt

Spanish mackerel: 12-35 ppt

Temperature

King mackerel: Migration appears limited by 68° F (20° C).

Spanish mackerel: Rarely found below 63° F (17° C).

HABITAT ISSUES

Habitat of Adults

King and Spanish mackerel adults inhabit coastal waters out to the edge of the continental shelf of the Gulf of Mexico and Atlantic Ocean. Their distribution is believed to be primarily dependent upon temperature and salinity. The adults spend most of their life cycle in ocean waters where environmental conditions are more stable, and man's effect is less severe. There appears to be little direct effect of man on adult habitat, nor does it appear likely that there will be a 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.

Habitat of Eggs and Larvae

Coastal and estuarine areas are extremely important as spawning and nursery areas for king and Spanish mackerel. Within the spawning area, eggs and larvae are concentrated in the surface waters. There is, at present, no documented evidence that larval habitat has been degraded by natural or man-made impacts 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 and/or leakage or discharge from operating oil wells is a potential danger to the spawning grounds of king and Spanish mackerel. The water soluble aromatic hydrocarbon components of crude oil is damaging to fish eggs and larvae. 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, although second generation dispersants are less toxic, due to the reduction of aromatic hydrocarbons (Wilson 1977).

Habitat of Prey Species

King and Spanish mackerel migrate and feed on seasonally abundant local resources. Many of these prey species are estuarine dependent, in that they spend all or part of their lives in estuaries. Accordingly, king and Spanish mackerel are to some degree dependent upon estuaries as a source of prey. The degradation of estuaries through landfill, dredging and run-off of domestic and/or industrial wastes will certainly have negative effects on prey stocks, ultimately affecting king and Spanish mackerel stocks.

THE FISHERIES

King mackerel

King mackerel support an important commercial fishery along the Gulf of Mexico and South Atlantic coasts. In recent years, king mackerel have been primarily caught commercially in south Florida and to an increasing extent off North Carolina and Louisiana. Historically, there was a small commercial fishery for king mackerel in the Chesapeake Bay with the introduction of pound nets and gill nets in the 1880's. Large scale commercial exploitation in Florida did not begin until the early 1900's. Total commercial catch appears to have averaged 4 million pounds during the 1920's and 1930's. Commercial landings trended downward, averaging 2.5 million pounds in the 1950's, increasing to 8 million pounds in the mid-1970's. Catches declined to 5 million pounds in 1978 and 1979, then increased to over 8 million pounds in 1982 (GMFAC, SAFMC 1985). The coastal fishery has been quota managed since 1985 and catches have averaged 3.5 million pounds.

In Virginia, commercial landings of king mackerel are incidental, although a small, directed hook and line fishery exists in some years. Commercial landings of king mackerel from 1982 through 1992 ranged from less than 2,000 pounds in 1983 to slightly over 14,000 pounds in 1988 (Figure 1). Pound nets (39%), hook and line (32%) and gill nets (23%) accounted for 94% of the ten year catch (Figure 2). For the same period, 54% of the commercial catch came from ocean waters while 46% of the landings were made inside the Bay (Figure 3). Predominance of ocean and Bay catches varied by year (Figure 4). Maryland's commercial landings of king mackerel are insignificant in most years (Figure 5).

In the recreational fishery, king mackerel are a major target species for the private boat and charter boat fleet along a widespread area of the Gulf of Mexico and South Atlantic regions. The Marine Recreational Fishery Statistics Survey (MRFSS) has estimated recreational king mackerel landings for the Atlantic and Gulf of Mexico regions since 1979. Total recreational landings averaged 1.8 million king mackerel from 1979 through 1984. Since 1985, the fishery has been quota-managed through size and bag limits. Within this framework, recreational catches have averaged 1 million king mackerel.

Virginia and Maryland's recreational landings of king mackerel are incidental, less than 30,000 fish combined annually from 1979 through 1993 (MRFSS data). In Virginia, king mackerel first appear in charter and private boat catches in June, are taken incidentally through the summer months and into October. In some years, sufficient numbers of king mackerel are available and directed trips are made during the fall. In the Virginia Saltwater Fishing Tournament, it takes a 20 pound king mackerel to qualify for a Citation. The number of Citations recorded between 1982 and 1993 have increased slightly (Figure 7) although effort information is not available. The Virginia State record was landed in 1991 and weighed 51 pounds.

Maryland has very limited data on its recreational harvest of king mackerel. Prior to 1986, the MRFSS either did not have any reports of king mackerel being landed or had combined king mackerel landings with other mackerel species into one category. Preliminary MRFSS estimates of king mackerel landings for Maryland waters during 1992 and 1993 were 8,916 and 1,389 fish, respectively. Data from charter boat logbooks indicate king mackerel have been available to anglers during July and August. The recreational charter boat harvest over the last three years (1991 - 1993) has ranged from 20 pounds (2 fish) to 1,492 pounds (275 fish) and is believed to occur entirely from Maryland's Atlantic coast. King mackerel have generally averaged between 5 and 10 pounds. In Maryland's Sport Fishing Tournament a 15 pound king mackerel qualifies for a Citation, though few have been issued. Maryland's state record was caught in 1985 at 47 pounds.

Spanish mackerel

The Spanish mackerel commercial fishery began about 1850 along the Long Island and New Jersey coasts, and was well established in the mid-Atlantic and Chesapeake Bay area by the late 1870's. In 1880, the Chesapeake Bay area produced 86% of the total coastal catch of 1.9 million pounds, while less than 2% of this catch was recorded from the South Atlantic and Gulf of Mexico. By 1887, the areas of major production had changed and about 64% of the total production occurred in these regions. This trend continued, and from 1950 through 1985 Florida accounted for more than 92% of the Spanish mackerel commercial landings. Since 1986, Florida's

contribution to the commercial harvest has been decreasing due to increased landings along the South and mid-Atlantic. Total commercial landings ranged between 5.0 million pounds (1955, 1978) and 18.0 million pounds (1976), and averaged approximately 8 million pounds during a period from 1950-1983. The coastal fishery has been quota managed since 1986.

Atlantic coast landings fluctuated between 1.9 million pounds in 1967 and 11.0 million pounds in 1977 (1950-1988). In 1986, a quota system was implemented and landings dropped from an average of 5.1 to 4.0 million pounds along the Atlantic coast for a period from 1978 through 1988 (ASFMC 1990 Spanish mackerel report data). Spanish mackerel is of major importance to the gill net fishery in south Florida where the main fishing areas are the Florida Keys and Atlantic coast between Palm Beach and Cape Canaveral. Smaller fisheries involve incidental catches in the North Carolina and Virginia pound net fisheries, the North Carolina long haul seine fishery and to a lesser extent in Georgia and South Carolina's shrimp trawl fishery. A small directed gill net fishery exists off the coast of North Carolina.

Spanish mackerel primarily occur in the lower Chesapeake Bay, Virginia, but may penetrate into Maryland waters, at least in years of abundance. Virginia's commercial landings of Spanish mackerel have increased dramatically since 1986. Between 1986 and 1992, landings ranged from a low of 168,609 pounds in 1986 to a high of slightly over 0.5 million pounds in 1990 (Figure 8). During this time period, pound nets accounted for over 80% of the landings (Figure 9) and 90% of the landings came from within the Bay (Figure 10) with little fluctuation from year to year (Figure 11).

Prior to 1983, Spanish mackerel landings did not appear in Maryland's commercial statistics. Since then, commercial landings have been gradually increasing and exceeded 36,000 pounds in 1991 (Figure 5). Pound nets account for the majority of landings.

A significant recreational fishery for Spanish mackerel exists coastwide. The fishery is primarily conducted by private and charter boat fishermen from the mouth of the bays to about 15 miles offshore. A small boat fishery exists inside bays and sounds, and good catches are made from fishing piers.

From 1979 through 1991, estimated recreational landings of Spanish mackerel along the Atlantic and Gulf of Mexico have averaged 3.5 million fish, without any apparent trend (MRFSS data). Estimated annual catches along the Atlantic coast ranged from a low of 122,000 fish in 1983 to a high of 1.9 million fish in 1988 (MRFSS data). Following the initiation of the MRFSS in 1979, Spanish mackerel landings were not reported in the Mid-Atlantic region until 1986. Recreational landings in the Mid-Atlantic region have increased dramatically since.

Recreational landings were first reported in Virginia in 1986, but were below 30,000 fish for 1986 and 1987. Landings increased sharply, averaging 116,000 fish from 1988 through 1991 (MRFSS data). A directed recreational fishery for Spanish mackerel recently evolved in Virginia due to an increase in their abundance. The dramatic increase in Virginia's recreational fishery parallels the commercial landings shown in Figure 8. Spanish mackerel become available in mid-to-late May at the mouth of the Bay, are caught throughout the Bay during the summer, and are concentrated at the mouth of the Bay and inshore coastal waters in September and early October. Due to the increased abundance and interest in Spanish mackerel, the Virginia Saltwater Fishing Tournament added this species to their Citation list in 1991, with a five pound minimum qualifying weight. Virginia's current State record was established in 1993 at nine pounds and thirteen ounces.

In Maryland, data on the recreational catch of Spanish mackerel is limited. Landings were first reported in 1986 and fluctuated between 0 and 41,000 Spanish mackerel from 1986 through 1993 (MRFSS data). Landings from charter boat logbooks indicate a minimum catch between 8,000 and 15,700 pounds (1991-1993). Average weight of Spanish mackerel by charter boat anglers was 2 pounds. The recreational catch in Maryland waters is dependent on availability which varies from year to year. A 5 pound Spanish mackerel qualifies for a Citation in Maryland's Sport Fishing Tournament, though few have been issued.

FISHERY PARAMETERS - ATLANTIC COAST STOCK

Status of Exploitation

King mackerel: Not overfished, fishing mortality rate is less than $F_{30\% SPR}$ and spawning stock appears to be adequate (Mackerel Stock Assessment Panel 1994).

Spanish mackerel: Not overfished, fishing mortality rate is less than $F_{30\% SPR}$ and spawning stock appears to be adequate (Mackerel Stock Assessment Panel 1994).

Long Term Potential

King mackerel: MSY is 26.2 million pounds (Atlantic and Gulf combined) (GMFMC, SAFMC 1985).

Spanish mackerel: MSY is 18.0 million pounds (Atlantic and Gulf combined) (GMFMC, SAFMC 1987).

Importance of the
Commercial Fishery

King mackerel:

Extremely important in Florida, which historically produced 90% of the total commercial landings.

In Virginia, king mackerel landings are incidental except for the few commercial hook and line fishermen, who fish in Federal waters. Dockside prices averaged slightly over \$1.00 per pound in 1992.

In Maryland, king mackerel commercial landings are insignificant.

Spanish mackerel:

Extremely important to Florida fishermen who have dominated the fishery in recent times.

In Virginia, Spanish mackerel commercial landings have increased dramatically since 1985, peaking at just over 500,000 pounds in 1990. Dockside prices averaged \$0.52 per pound in 1993.

In Maryland, Spanish mackerel commercial landings have been gradually increasing. In 1991, over 36,000 pounds were reported. Dockside prices averaged \$0.52 per pound in 1993.

Importance of the
Recreational Fishery

King mackerel:

Highly regarded as a sport fish. Particularly important to the charter boat and offshore private boat fleets.

In Virginia, king mackerel recreational landings are incidental. In some years, a small directed fishery exists when sufficient numbers of fish appear.

In Maryland, king mackerel recreational landings are incidental. Very limited data on recreational harvest is available.

Spanish mackerel:

A significant Spanish mackerel private and charter boat sport fishery exists along the Atlantic and Gulf coasts. Most anglers who target Spanish mackerel fish

from private boats, but significant catches are also made from charter boats, fishing piers and shore.

In Virginia, a directed sport fishery for Spanish mackerel has recently evolved as the stocks have been re-built.

In Maryland, Spanish mackerel recreational catch depends on availability.

Fishing Mortality Rates

King mackerel: $F = 0.12$ (age 3+ fish) (Mackerel Stock Assessment Panel 1994).

Spanish mackerel: $F = 0.18$ (age 2+ fish) (Mackerel Stock Assessment Panel 1994).

Spawning Potential Ratio (SPR)

King mackerel: $SPR = 45\%$ (Mackerel Stock Assessment Panel 1994).

Spanish mackerel: $SPR = 42\%^*$ (Mackerel Stock Assessment Panel 1994).

* May be overestimated due to low bycatch estimates.

Fishing Mortality Rate SPR 30%

King mackerel: $F_{30\% SPR} = 0.29$ (Mackerel Stock Assessment Panel 1994).

Spanish mackerel: $F_{30\% SPR} = 0.71$ (Mackerel Stock Assessment Panel 1994).

RESOURCE STATUS

The Coastal Pelagics FMP (GMFMC, SAFMC 1989 and GMFMC, SAFMC 1992) defines overfishing as follows:

a) A mackerel stock shall be considered overfished if the spawning potential ratio (SPR) is less than the target level percentage recommended by the assessment group, approved by the Scientific and Statistical Committee (SSC), and adopted by the Councils. The target level percentage shall not be less than 30 percent.

b) When a stock is overfished (as defined in (a)), the act of

fishing is defined as harvesting at a rate that is not consistent with a program to rebuild the stock to the target level percentage, and the assessment group will develop ABC ranges for recovery periods with a program to rebuild an overfished stock.

c) When a stock is not overfished (as defined in (a)), the act of overfishing is defined as a harvest rate that if continued would lead to a state of the stock that would not at least allow a harvest of Optimum Yield (OY) on a continuing basis, and the assessment group will develop Allowable Biological Catch (ABC) ranges based upon OY (currently Maximum Sustainable Yield (MSY)).

King Mackerel

The Atlantic migratory group of king mackerel has continued to recover and is not considered overfished. Catches have remained relatively stable since 1981. Estimates of catch-at-age indicate that recruitment in recent years was higher than mid-1980 estimated levels. These year classes are beginning to enter the fishery in significant numbers as shown by Virtual Population Analysis (VPA) results and the basic catch-at-age data. There appears to be an adequate spawning biomass present which should continue to increase in the future if increases in fishing mortality rate do not occur. Current fishing mortality rates are below $F_{30\% SPR}$ levels and SPR is at 45% (1992-93).

The Stock Assessment Panel still evaluates the Gulf migratory group as being overfished. Recent estimates indicate fishing mortality rates are above $F_{30\% SPR}$ levels and SPR is below 30%. SPR has been improving, although continued overage of catches will increase the risk of not reaching the SPR goal of 30% by the target recovery year of 1997.

Spanish Mackerel

The Stock Assessment Panel recently agreed that the Atlantic migratory group of Spanish mackerel is not currently overfished. Since the coastal fishery became fully regulated in 1986-87, the condition of the fishery began improving. Fishing mortality rates dropped below $F_{30\% SPR}$ levels and SPR increased above 30%. Recruitment appears to be strong and if allowed to survive could further benefit the spawning biomass.

The Gulf migratory group has not recovered as well, and is currently considered overfished. Fishing mortality rates have not been controlled and continue to exceed $F_{30\% SPR}$. As a result SPR has remained below 30%. A primary concern is the level at which bycatch is occurring within the Gulf. If not reduced SPR will likely be prevented from ever achieving 30%.

CURRENT LAWS AND REGULATIONS

Limited Entry:

The Virginia Marine Resources Commission has the power to limit entry into a fishery and has limited entry into the pound net fishery. Entry in the commercial king and Spanish mackerel fishery in the Exclusive Economic Zone (EEZ) is controlled by a Federal vessel permit. Annual permits issued by NMFS are required for charter boats fishing for Spanish or king mackerel for hire in federal waters.

Maryland's limited entry law, effective 1 April 1994, limits the number of commercial tidal fish licenses available to individuals who can commercially harvest finfish in tidal waters of Maryland. Individuals who currently have licenses and people who applied for licenses before April 1, 1994 will be able to retain their licenses. Waiting lists will be used to issue new licenses, but no new licenses will be issued until the number of licenses is more in balance with the harvestable resource.

Minimum Size Limit:

14-inch TL for Spanish mackerel in Maryland's recreational and commercial fisheries and Virginia's recreational fisheries.

14-inch TL for king mackerel in Virginia's recreational fishery and no minimum size limit in Virginia and Maryland's commercial fisheries or Maryland's recreational fishery.

Creel Limit:

5 king mackerel/person/day in Virginia's recreational fishery, and no recreational creel limit in Maryland.

10 Spanish mackerel/person/day in Maryland and Virginia's recreational fishery.

Harvest Quotas (Atlantic coast):

King mackerel: 10 million pounds (1994-95).

Spanish mackerel: 9.2 million pounds (1994-95).

Allocations (Atlantic coast):

King mackerel: Commercial - 37.1%

Recreational - 62.9%

Spanish mackerel: Commercial - 50%

Recreational - 50%

Bycatch Restrictions:

Licensed Virginia pound net fishermen, fishing in Virginia waters, are exempt from king and Spanish mackerel minimum sizes.

There are no bycatch restrictions in Maryland waters.

Season:

Open year-round in state waters of Maryland and Virginia.

In the EEZ (3-200 miles offshore), commercial and recreational fishing is closed when the quota has been reached.

Gear Area Restrictions:

Virginia:

Trawling is prohibited in the Chesapeake Bay and Territorial Sea. It is unlawful to set, place or fish a fixed fishing device of any type within 300 yards of the Chesapeake Tunnel. Also, Sections 28.1-52 and 28.1-53 of the Code of Virginia outline placement, total length and distance requirements for fishing structures.

Maryland:

Purse seines, trawls, trammel nets and mono-filament gill nets are prohibited (otter and beam trawls are legal on the Atlantic coast at distances of one mile or more offshore). Prohibition on gill netting in most areas of Chesapeake Bay and its tributaries during the summer.

Potomac River:

Current moratorium on any new gill net, pound net, or hook and line licenses. The use of a purse net, beam trawl, otter trawl or trammel net are prohibited. Length restrictions for various gear types exist. Gill nets are restricted to a mesh size of 5.0 to 7.0 inches. Seasonal restrictions for gill net are: anchor or

stake gill net, June 1 through Nov. 30,
drift gill net, closed.

STATUS OF TRADITIONAL FISHERY MANAGEMENT APPROACHES

The following definitions have been adapted from the documents, "Status of the Fishery Resources Off the Northeastern United States" for 1989 and 1990 (NOAA Technical Memoranda NMFS-F/NEC-72 and 81). For a more thorough review of fisheries terminology, refer to this document under the section "Definitions of Technical Terms".

Catch-Per-Unit-Effort (CPUE): Defined as the number or weight of fish caught during a specific unit of fishing time and considered a basic measure of abundance or stock density.

Estimates of Mortality: A mortality rate is the rate at which fish die from natural causes or fishing. Mortality rates can be expressed in terms of instantaneous or annual mortality. Instantaneous rates are used extensively in fisheries management for ease in comparing the relative importance of different sources of mortality. Annual mortality rates can easily be converted to percentages, while instantaneous rates cannot. The instantaneous total mortality rate (Z) is the natural logarithm of the ratio of the number of fish alive at the beginning of the same period of time. Fishing mortality is usually expressed in terms of an instantaneous rate (F), as is natural mortality (M). For example, an instantaneous total mortality rate (Z) of 1.5 equals annual mortality rate of 0.78 or 78% annual total mortality. Instantaneous mortality rates are additive, but annual rates are not.

Yield-Per-Recruit (YPR): The theoretical yield that would be obtained from a group of fish of one year-class if harvested according to a certain exploitation rate over the life-span of the fish.

Spawning Stock Biomass (SSB) and Spawning Stock Biomass Per Recruit (SSBR): SSB is the weight of all adult females in the population, calculated as the remaining number of individual females in each year-class, times the percent that are mature, times their average weight. SSBR is the total contribution of a cohort (year-class) to the SSB over its lifetime, determined by summing its contribution at each age.

Stock-Recruitment: The relationship between the adult stock size and subsequent recruitment (fish that reach a certain size or age in a specific year).

Maximum Sustainable Yield (MSY): The largest average catch that can be continuously taken from a stock under existing

environmental conditions, while maintaining stock size.

Virtual Population Analysis (VPA): An analysis of the catches from a given year-class over its life in the fishery.

RESEARCH NEEDS

Improved management of the Chesapeake Bay and Atlantic Coast King and Spanish Mackerel FMP will result as new research information becomes available. The following items of research proposed by the Coastal Pelagics FMP and ASFMC Spanish Mackerel FMP are applicable to this plan.

- 1) Provide better estimates of recruitment, natural mortality rates, fishing mortality rates, and standing stock. Specific information should include an estimate of total amount caught and distribution of catch by area, season, and type of gear.
- 2) Research on the consequences and estimation of bycatch needs to be completed.
- 3) Conduct migration studies to determine normal migration routes and changes therein, and the climatic or other factors responsible for changes in the environmental and habitat conditions which may affect the habitat and availability of stocks.
- 4) Evaluate size at age of both king and Spanish mackerel.

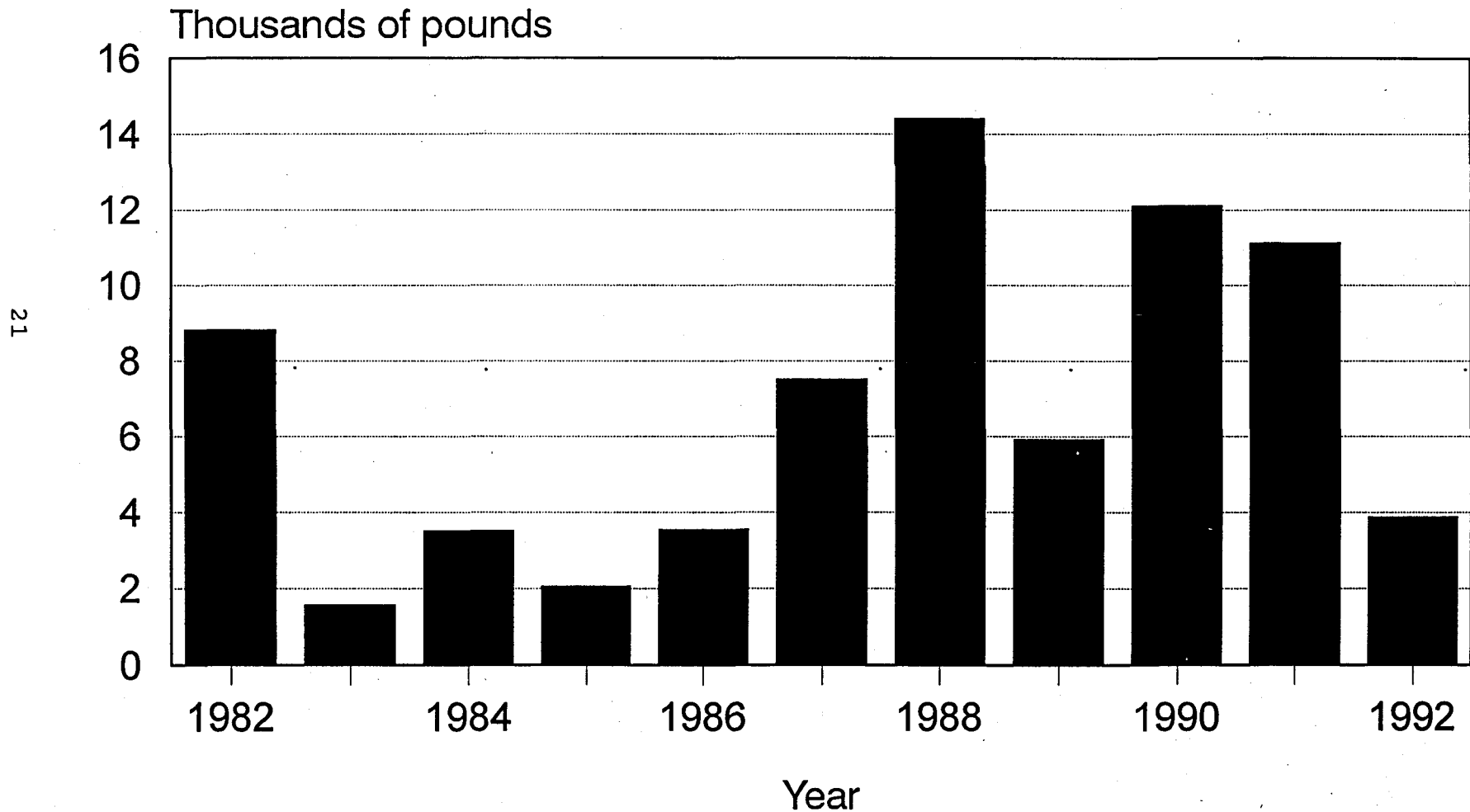
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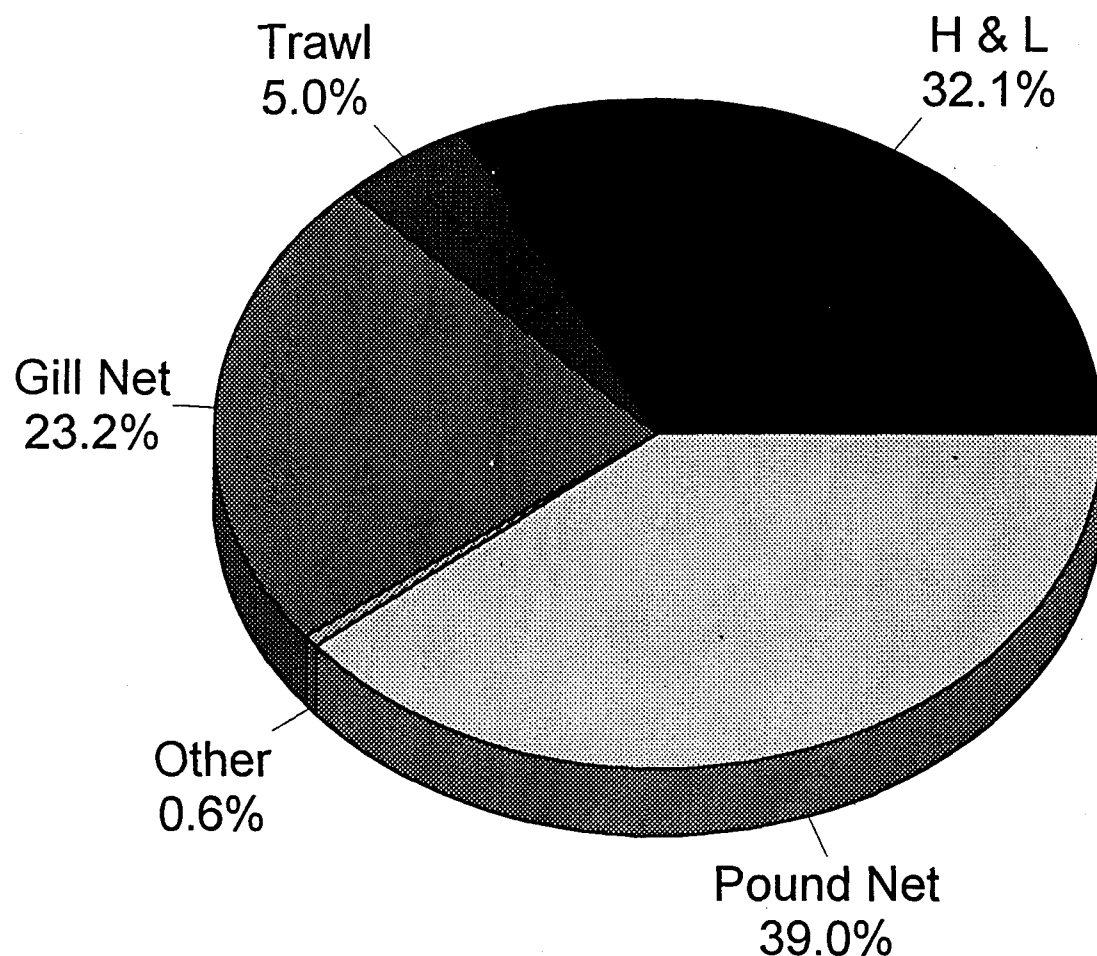
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Figure 1. Virginia Commercial King Mackerel Landings



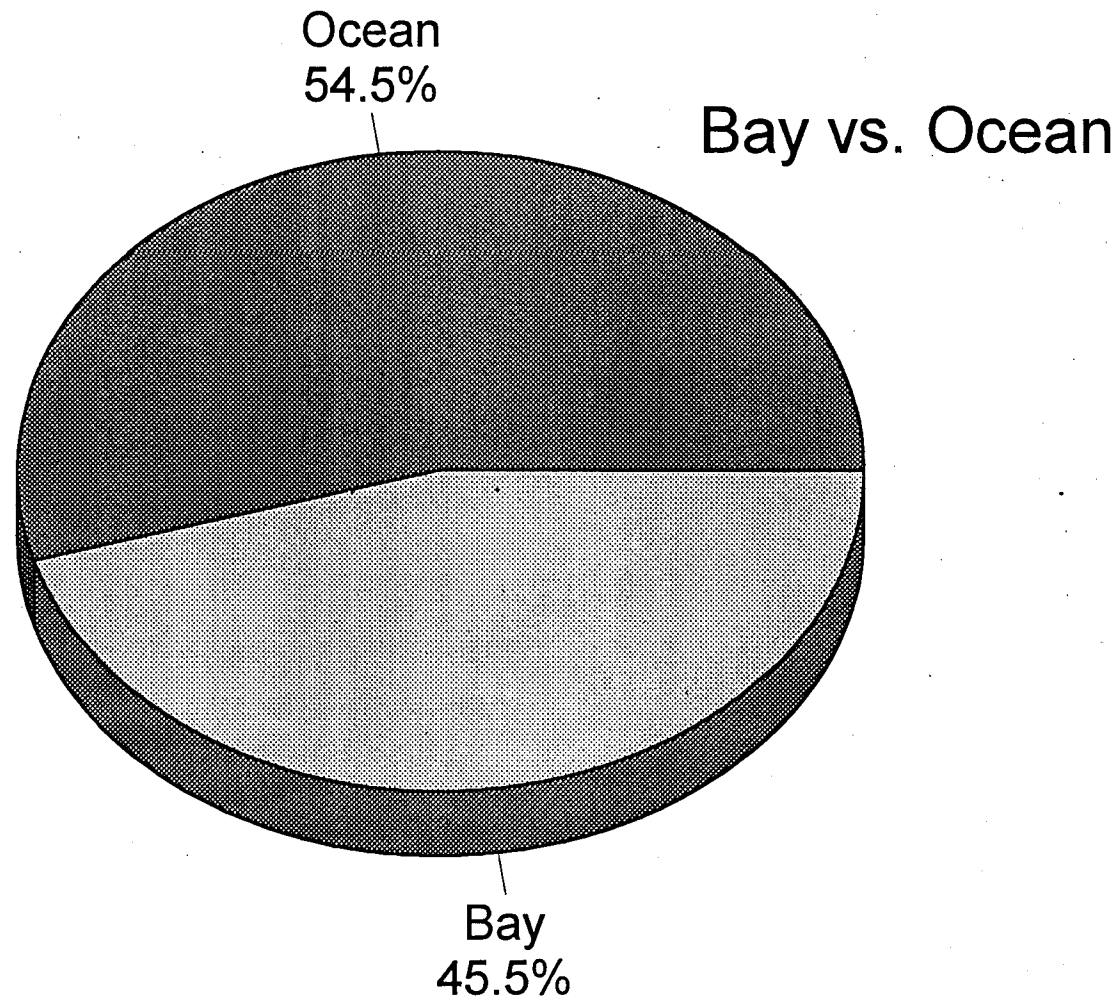
VA data

Figure 2. Virginia Commercial King Mackerel Landings By Gear



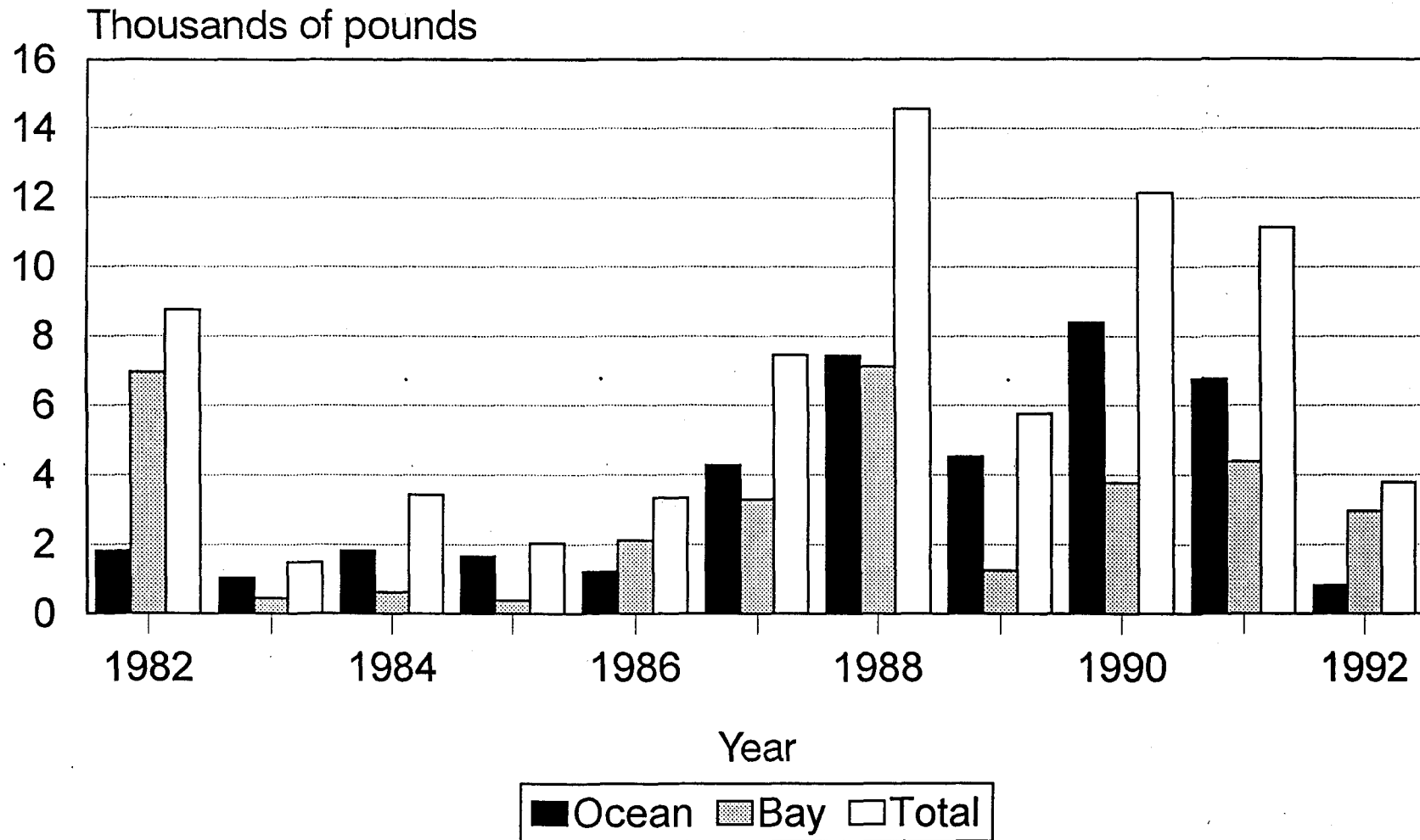
Other = haul seine, longline and weir
VA data, 1982-1992 landings

Figure 3. Virginia Commercial King Mackerel Landings



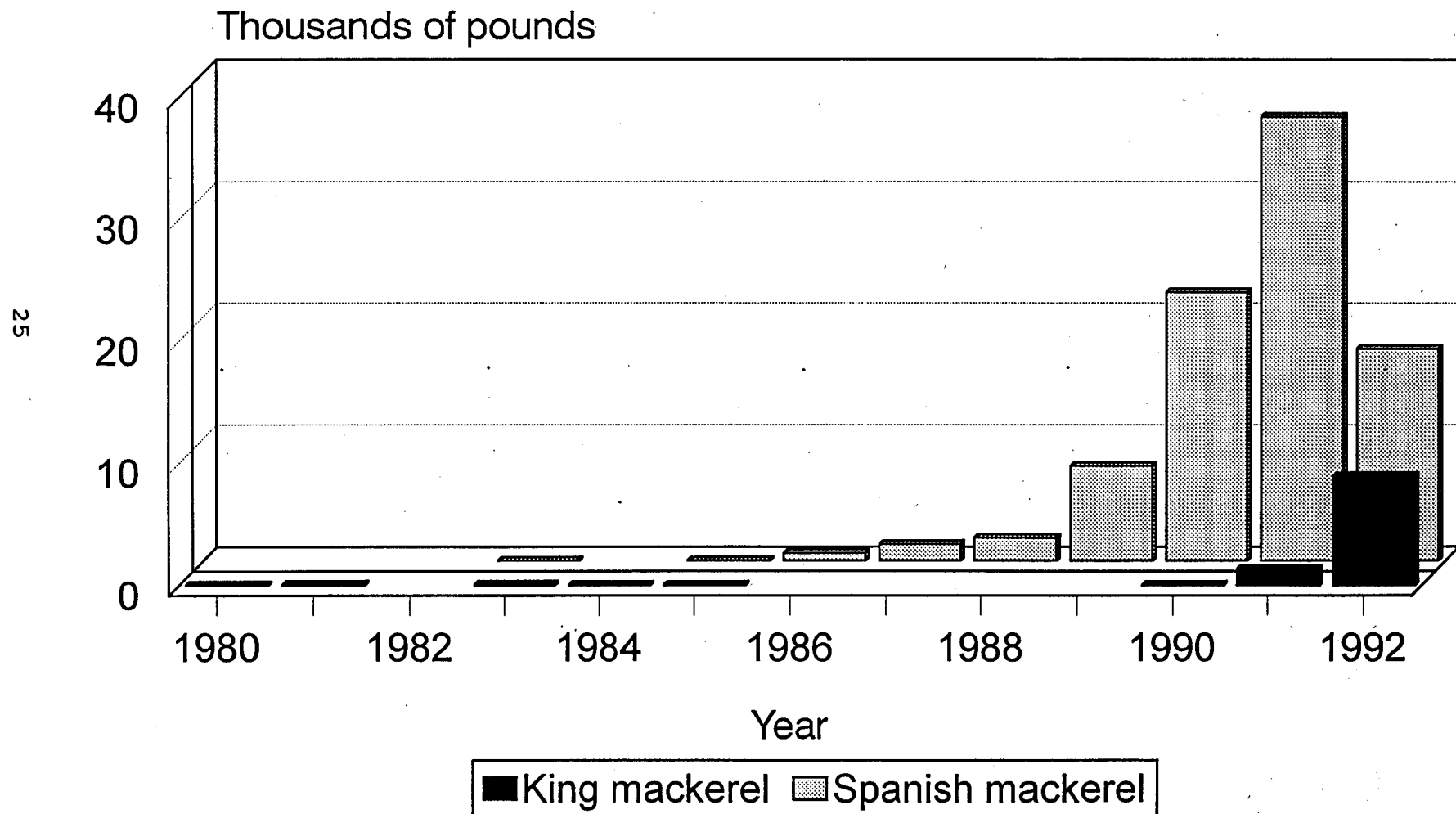
VA data, 1982-1992 landings

Figure 4. Virginia Commercial King Mackerel Landings



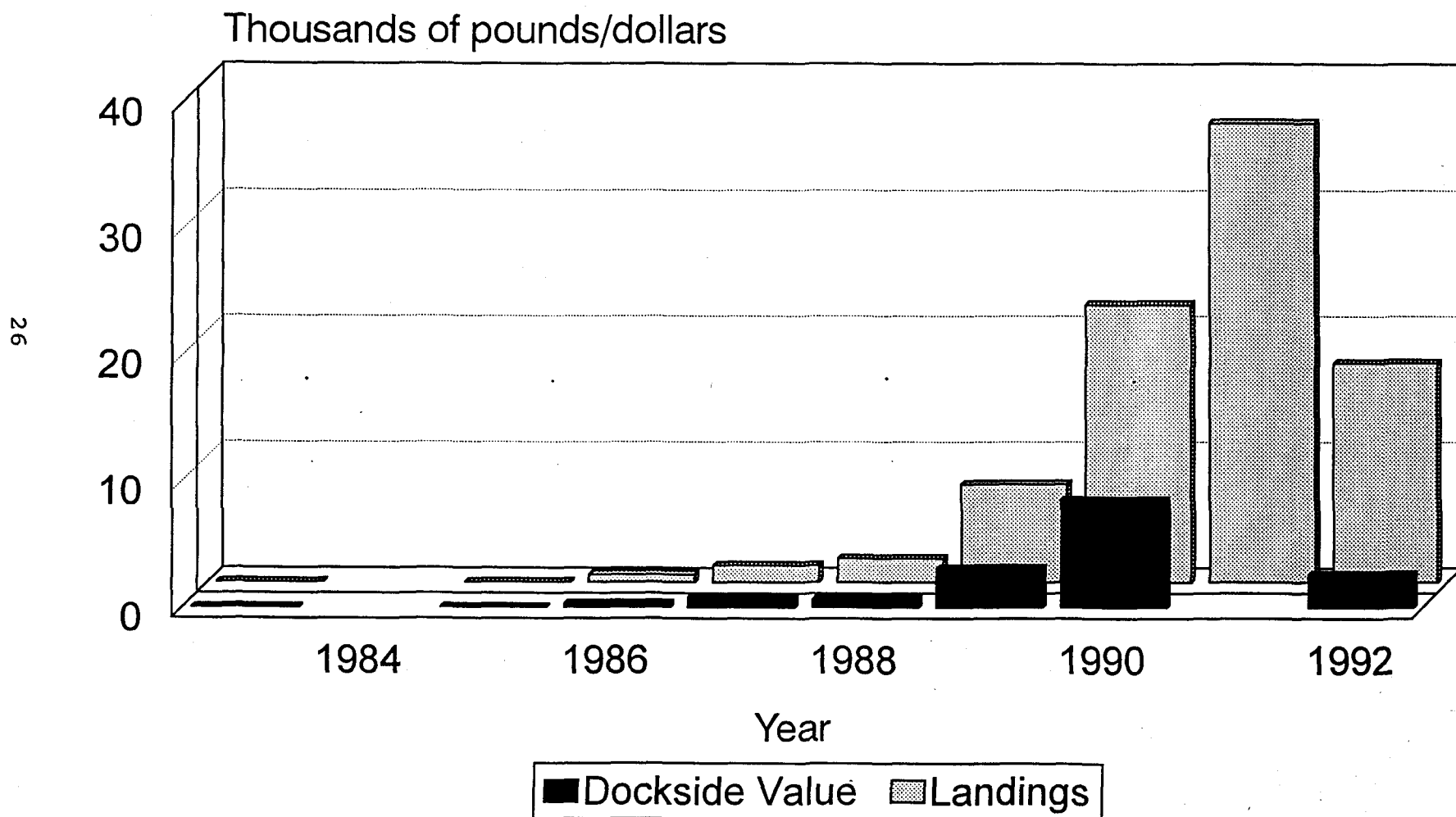
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Figure 5. Maryland Commercial King and Spanish Mackerel Landings



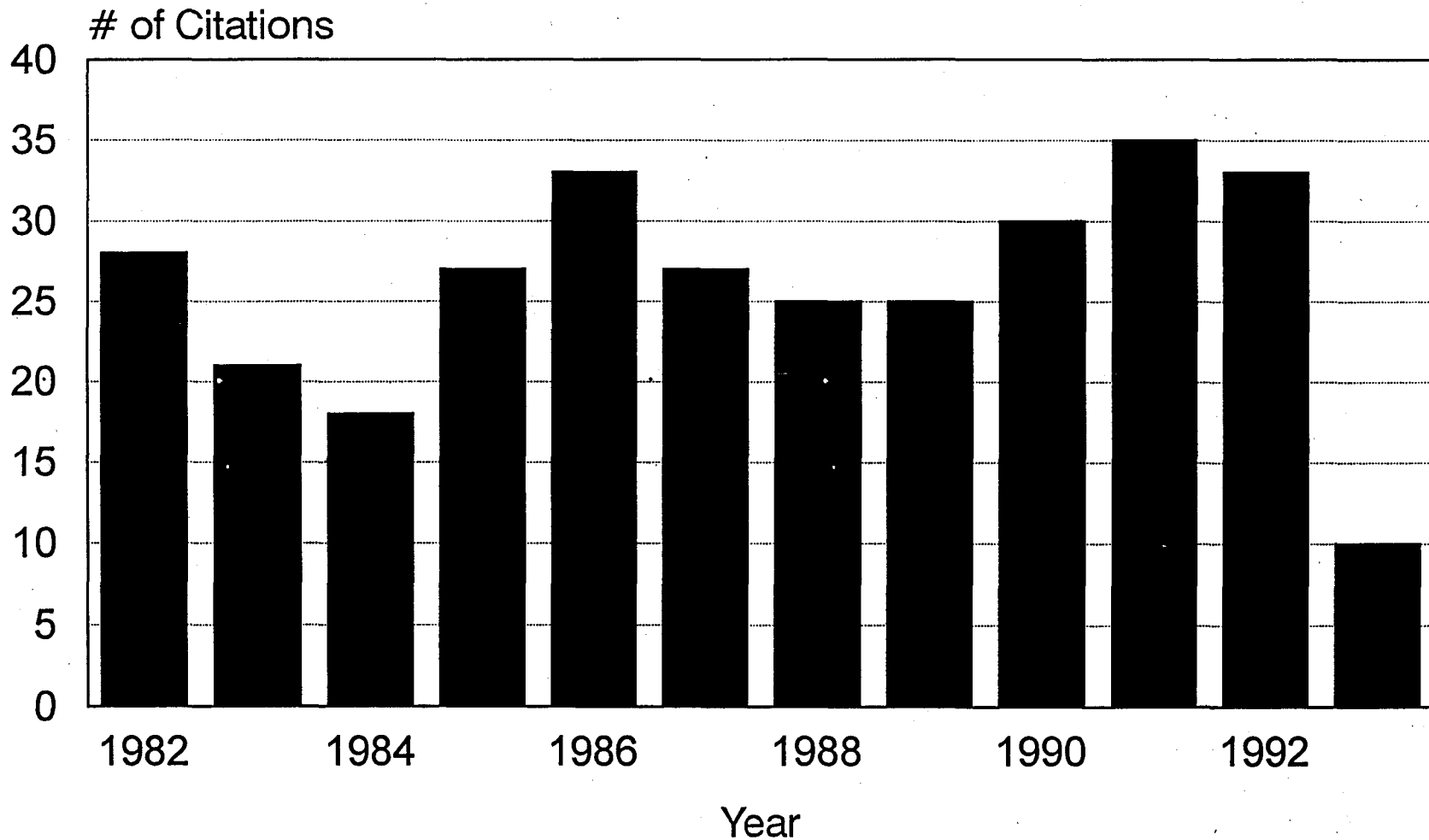
MD data

Figure 6. Maryland Spanish Mackerel Commercial Landings & Dockside Value



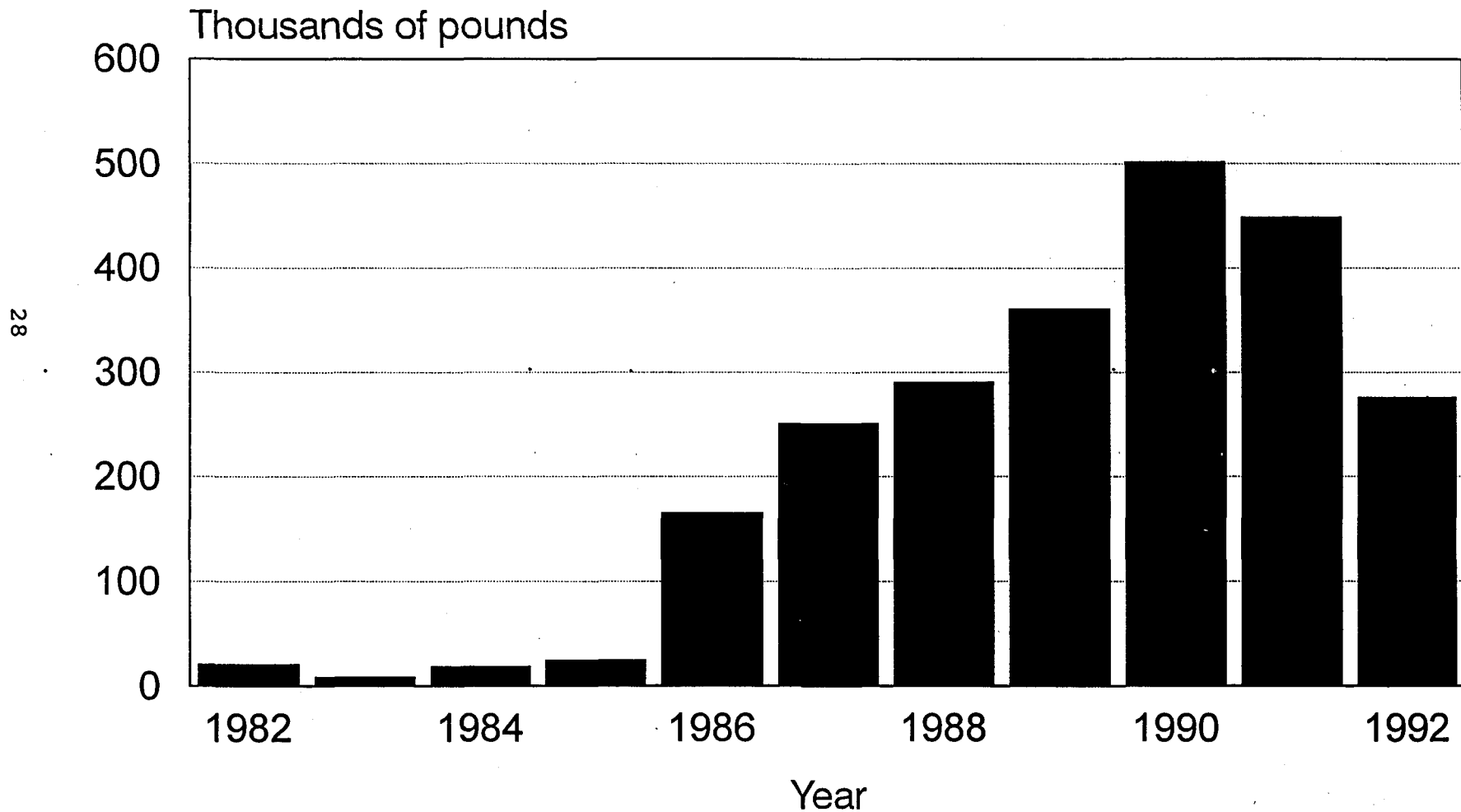
MD data, 1991 value not available

Figure 7. Virginia King Mackerel Citations



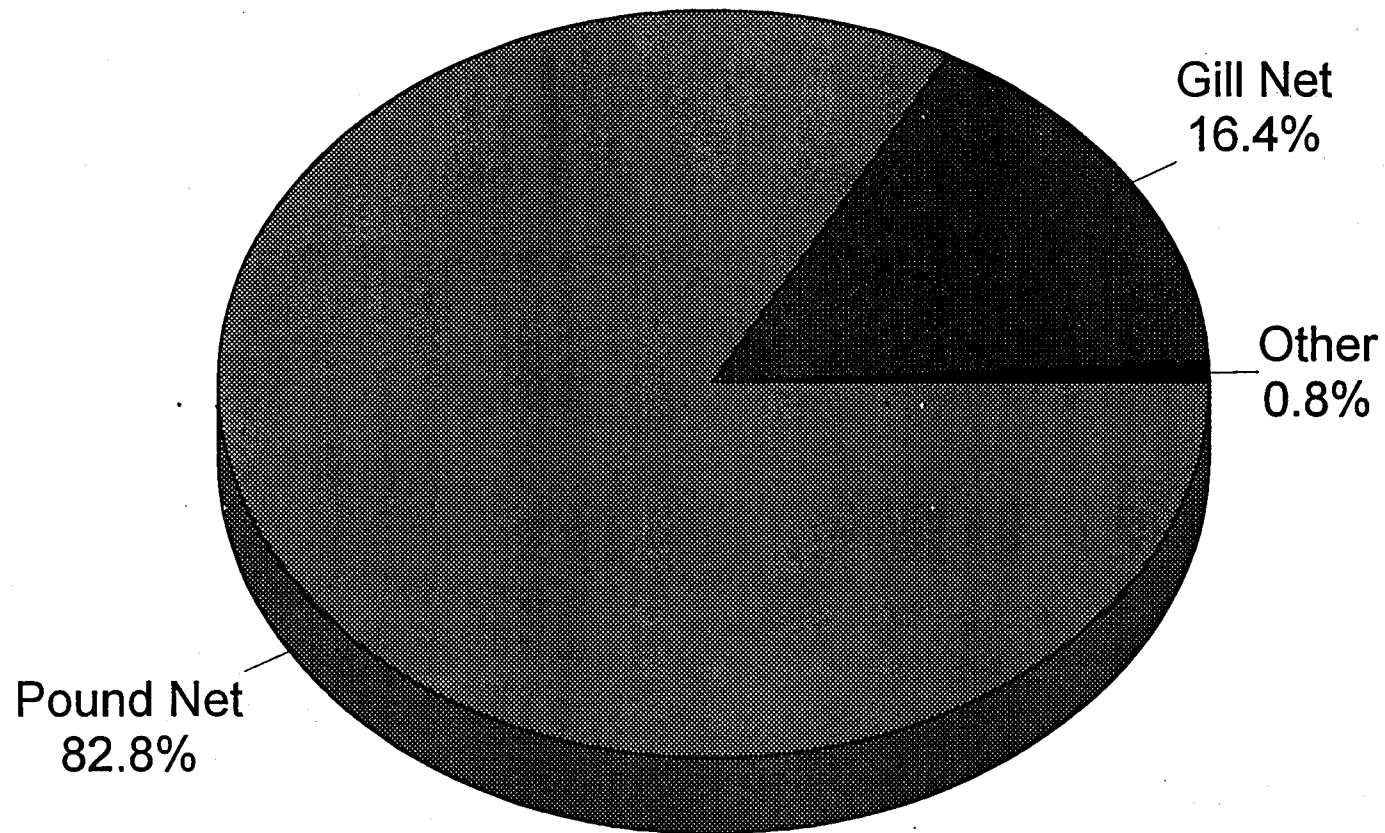
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Figure 8. Virginia Commercial Spanish Mackerel Landings



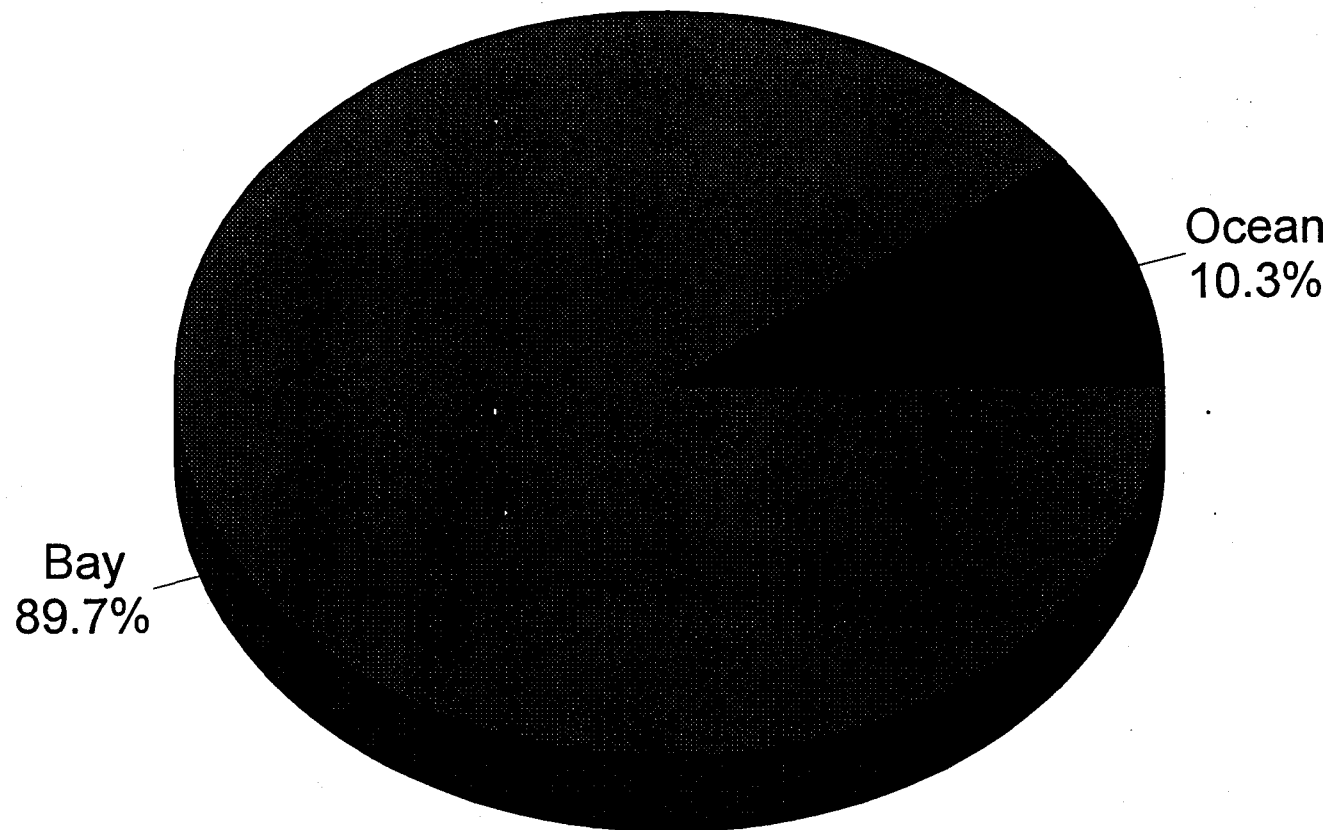
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Figure 9. Virginia Commercial Spanish Mackerel Landings By Gear



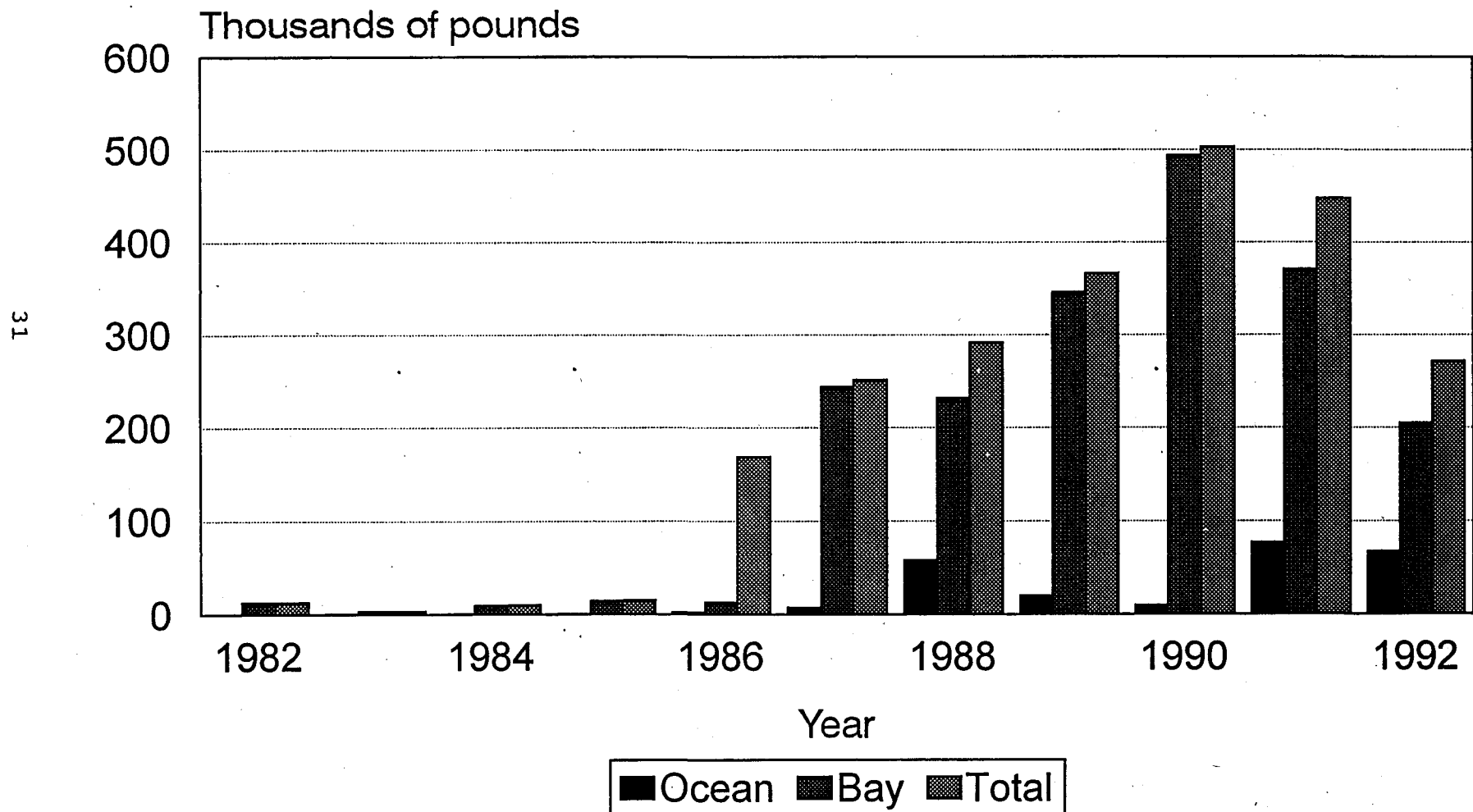
Other = fyke net, H&L, haul seine, trawl
VA data, 1986-1992 landings

Figure 10. Virginia Commercial Spanish Mackerel Landings



VA data, 1986-1992

Figure 11. Virginia Commercial Spanish Mackerel Landings



Ocean landings <600 lbs., 1982-1986
VA data

Section 2. KING AND SPANISH MACKEREL MANAGEMENT

COASTAL FISHERY MANAGEMENT PLAN: STATUS AND MANAGEMENT UNIT

The South Atlantic Fishery Management Council and Gulf of Mexico Fishery Management Council prepared a joint fishery management plan for coastal migratory pelagic resources, including Spanish mackerel, king mackerel, cero mackerel, cobia, dolphin, little tunny and bluefish. This plan, referred to as the Coastal Pelagic FMP, was approved in November, 1982 and implemented by federal regulations in February 1983. In 1985, Amendment I to the Coastal Migratory Pelagics FMP was approved to address new problems and issues and provide more timely management response, particularly for king mackerel. Amendment 2, implemented in 1987, resulted from the need to further reduce the catch of Spanish mackerel to allow the stock to recover. Amendment 2, also clarified the intent of the Councils to set total allowable catch (TAC) for mackerels, revised maximum sustainable yield, modified the fishing year, delineated Spanish mackerel groups, established allocation procedures for Spanish mackerel, regulated fishing gear and provided fishing permits. Amendment 3, prohibited the use of drift gill nets in the Spanish mackerel fishery. Amendment 4, reallocated the Atlantic migratory group of Spanish mackerel between commercial and recreational fishermen to 50% for each group based on catches from the mid 1970's. Amendment 5, extended the management area of the Atlantic migratory group through the Mid-Atlantic Council's area of jurisdiction, revised the definition of "overfishing", redefined recreational bag limits as daily limits instead of trip limits, required coastal pelagics with size limits be landed with head and fins intact and established a \$23 annual fee for commercial and charter permits beginning 1 April 1991. Amendment 6, increased the minimum size limit for king mackerel, modified the recreational fishing year, established a specific time period in which to rebuild overfished stocks and identified additional problems within the fisheries. Amendment 7, proposes to suballocate the Eastern Zone Gulf migratory group of king mackerel commercial quota, further suballocate the quota within the two areas between net and hook and line fishermen, and require permits to specify gear type fished.

The Coastal Pelagics FMP and the seven amendments which have followed, and the Atlantic States Marine Fisheries Commission Spanish mackerel FMP (1990) provide the source documents for the Chesapeake Bay and Atlantic Coast King and Spanish Mackerel Fishery Management Plan.

Management strategies and actions will be implemented by the jurisdictions to protect and enhance the stocks of king and Spanish mackerel utilizing the Chesapeake Bay and its tributaries, and throughout its Atlantic coast range. Existing regulations regarding the harvest of these species will continue to be enforced except where otherwise indicated by the plan.

A. Goal Statement and Objectives

The goal of this plan is to:

Enhance and perpetuate king and Spanish mackerel stocks in the Chesapeake Bay and its tributaries, and throughout their Atlantic coast range, so as to generate optimum long-term ecological, social and economic benefits from their commercial and recreational harvest and utilization over time.

In order to achieve this goal, the following objectives must be met:

- 1) Continue recovery of the king and Spanish mackerel stocks and stabilize the stock at a level capable of producing maximum sustainable yield.
- 2) Achieve compatible management throughout the range of king and Spanish mackerel.
- 3) Minimize disruption of traditional fisheries and market for king and Spanish mackerel.
- 4) Promote protection of the resource by maintaining a clear distinction between conservation goals and allocation issues.
- 5) Promote the cooperative interstate research and comprehensive monitoring activities that furnish information for effective management, and establish a mandatory and timely reporting system for monitoring catch and quotas.
- 6) Promote fair allocation of allowable harvest among various components of the fishery.
- 7) Minimize waste in the fisheries.
- 8) Continue to provide guidance for the development of water quality goals and habitat protection necessary to protect the king and Spanish mackerel population within the Bay and coastal waters.

B. Problem Areas and Management Strategies

Problem 1.1: Stock Status

King and Spanish mackerel are presently managed under the Coastal Pelagics FMP and by individual states. The Coastal Pelagics FMP states that a mackerel stock shall be considered overfished if the SPR is less than 30%. Recent stock assessments indicate that management measures in the South Atlantic have been effective in rebuilding stocks. Fishing mortality rates for both

king and Spanish mackerel Atlantic migratory groups are below $F_{30\% SPR}$ and SPR are above 30%. As a result, recovering mackerel stocks have expanded their range and increased in abundance in areas where they historically occurred but had declined or disappeared. The majority of Spanish mackerel and about half of the king mackerel harvests occur in state waters. To continue the efforts put forth by the SAFMC compatible and coordinated interjurisdictional management is essential.

Strategy 1.1: The states will adopt regulations consistent with the recommendations of the SAFMC and in effect in Federal waters.

Action 1.1.1: A) Virginia will continue to enforce a 14-inch TL minimum size limit and a 10 fish/person/day creel limit for Spanish mackerel.

B) Maryland will continue to enforce a 14-inch TL minimum size limit for both the recreational and commercial fisheries and a 10 fish/person/day creel limit for Spanish mackerel.

Implementation: Continuing

Action 1.1.2: A) Virginia will continue to enforce a 5 fish/person/day creel limit for king mackerel.

B) Maryland will adopt a 5 fish/person/day creel limit for king mackerel.

Implementation: A) Continuing; B) 1995

Action 1.1.3: Virginia and Maryland will adopt a 20-inch FL (fork length) or 23-inch TL minimum size limit for king mackerel.

Implementation: 1995

Action 1.1.4: Virginia and Maryland will close their respective commercial and recreational fisheries for king and Spanish mackerel when such closures are in effect in Federal waters.

Implementation: 1995

Problem 2.1: Monitoring Catch and Quotas, and Research Needs

One of the key elements of the Coastal Pelagics FMP is management through quotas. For this approach to succeed, cooperative interstate research and comprehensive monitoring are

essential.

Strategy 2.1: The states will track the commercial and recreational harvest of king and Spanish mackerel, provide such information to the SAFMC on a timely basis and support research needs.

Action 2.1.1: Virginia will continue harvester-based, mandatory, monthly reporting of commercial landings. Maryland will continue buyer-based, mandatory reporting of commercial landings.

Implementation: Continuing

Action 2.1.2: Virginia and Maryland will continue to supplement the Marine Recreational Fisheries Statistics Survey to provide more precise estimates of recreational landings. Maryland will continue the requirement of charter boat logbooks.

Implementation: Continuing

Action 2.1.3: The jurisdictions will support stock assessment research for the Atlantic stocks of king and Spanish mackerel. Virginia's Stock Assessment Program will continue to sample Spanish mackerel for length/weight frequencies.

Implementation: Continuing

Problem 3.1: Waste/Sublegal Bycatch and Hook and Release Mortalities

Sublegal Spanish mackerel, and occasionally king mackerel, are taken in commercial gear set for mixed species such as pound nets, haul seines, and to a lesser extent, gill nets. King and Spanish mackerel are caught and released by recreational fishermen when they are under the minimum size limit or the bag limit has been reached. Both king and Spanish mackerel are delicate fish that handle poorly. They have very small scales, thin skin and bleed easily. Also, they are very active fish, and do not survive long out of the water.

Strategy 3.1: The states will investigate means of reducing undersized bycatch in the commercial fisheries and reducing hook and release mortalities in the recreational fisheries.

Action 3.1.1: Virginia will continue to evaluate the use of escape panels as a means of reducing undersized

bycatch in the pound net fishery and will explore the use of panels in haul seines. Virginia will continue a 2 7/8-inch minimum mesh size for gill nets.

Implementation: Continuing

Action 3.1.2: The jurisdictions will support angler educational programs, such as the Chesapeake Bay Foundation's "Careful Catch Program", which promote proper hook and release techniques.

Implementation: Continuing

Action 3.1.3: Virginia will monitor bycatch sold as crab bait from the pound net and haul seine fisheries.

Implementation: 1994

Problem 4.1: Habitat Issues

Increasing urbanization and industrial development of the Atlantic coastal plain has resulted in a decrease in the environmental quality of many estuarine communities. Estuarine habitat loss and degradation in Chesapeake Bay may have adverse effects on king and Spanish mackerel stocks. Since the signing of the 1987 Chesapeake Bay Agreement, the Bay jurisdictions (District of Columbia, Environmental Protection Agency, Maryland, Pennsylvania, the Potomac River Fisheries Commission, and Virginia) have focused on improving water quality and habitat for living resources.

Strategy 4.1: The jurisdictions will continue to refine their water quality and habitat programs to provide better water quality and habitat for living resources in the Bay. The following is a brief summary of each of the Bay initiatives concerning water quality and habitat.

Tributary Strategies - Directs the reduction in nutrients reaching the Bay by establishing tributary-specific strategies. The strategies include: public participation; nutrient reduction goals of 74 million pounds of nitrogen and 8.4 million pounds of phosphorus baywide (meets 40% reduction); annual report of accountability; and, a reevaluation in 1997 to ensure the reduction goals are met by the year 2000.

Submerged Aquatic Vegetation (SAV) restoration - The abundance of bay grasses or SAVs is an important indicator of the Bay's health because of the link to

water quality. SAVs also provide shelter and nursery areas for many species of fish and wildlife. SAV directives include: an interim goal of restoring 114,000 acres by the year 2005; restoring SAVs to their historical levels; and, developing an additional target for restoring SAVs to all shallow water areas to the 1 meter depth contour.

Toxics Reduction Strategies - No evidence of a severe, systemwide toxics problem has been found but there are some serious localized problems. At this time, the Elizabeth River, Baltimore Harbor and the Anacostia River are designated as the initial Chesapeake Bay Regions of Concern. Existing Bay Programs are reducing toxics entering the Bay and concentrations of toxics in fish, shellfish, wildlife, and in the aquatic environment are generally declining. Directives for reducing toxics include: promoting pollution prevention through public education and technical assistance programs; an integrated pest management program for controlling and minimizing pesticide usage; and, reaffirming consistency with the requirements of the Clean Water Act and the Clean Air Act.

Agricultural Nonpoint Source Initiative - Agriculture is a major contributor of nonpoint source pollution to the Bay. An independent committee was created to develop specific recommendations to achieve greater nonpoint source pollution reductions from agricultural sources. Directives include: assisting farmers to develop and implement comprehensive and integrated site-specific management of land, water, and ecological resources; and, assisting state and federal agencies to develop and implement total resource management.

Action 4.1.1: The jurisdictions will continue to work with the Chesapeake Bay Program, the Coastal Bay Initiative, and water quality improvement goals for the Bay and coastal areas.

Implementation 4.1: Continuing

**IMPLEMENTAION MATRIX
FOR THE CHESAPEAKE BAY AND ATLANTIC COAST
KING AND SPANISH MACKEREL FISHERY MANAGEMENT PLAN**

Problem Area	Action	Date	Comments
1. Stock Status	1.1.1 A) VA will enforce a 14-inch TL minimum size limit and a 10 fish/person/day bag limit for Spanish mackerel.	1991; Continue	
	1.1.1 B) MD will enforce a 14-inch TL minimum size limit for both the recreational and commercial fisheries and a 10 fish/person/day bag limit for Spanish mackerel.	1993; Continue	
	1.1.2 A) VA will enforce a 5 fish/person/day bag limit for king mackerel.	1991; Continue	
	1.1.2 B) MD will enforce a 5 fish/person/day bag limit for king mackerel.	1995	Implementation as early as Sept. 1995.
	1.1.3 VA and MD will enforce a 20-inch FL (fork length) or 23-inch TL minimum size limit for king mackerel.	1995	Implementation as early as Sept. 1995.
	1.1.4 VA and MD will close their respective commercial and recreational fisheries for king and Spanish mackerel when such closures are in effect in Federal waters.	1995	Closures will be in compliance with South Atlantic Fishery Management Council (SAFMC) recommendations.

IMPLEMENTATION MATRIX CONTINUED

Problem Area	Action	Date	Comments
2. Monitoring Catch and Quotas, and Research Needs	2.1.1 VA and MD will require mandatory reporting of commercial landings.	VA 1/1/93; Continue	VA: Harvester-based reporting. MD: Buyer-based reporting.
	2.1.2 VA and MD will supplement the Marine Recreational Statistics Program. MD will require charter boat logbooks.	Continue	The coastal charter boat logbook system was improved in 1994.
	2.1.3 Jurisdictions will support stock assessment research for mackerel stocks.	Continue	VA will continue to sample Spanish mackerel for length and weight frequencies.
3. Waste/Sublegal Bycatch and Hook and Release Mortalities	3.1.1 VA will evaluate the use of escape panels as a means of reducing undersized bycatch. VA will enforce a 2 7/8-inch minimum mesh size for gill nets.	Continue	VA is presently conducting a study of escape panels in pound nets and will evaluate the use of escape vents in haul seines.
	3.1.2 Jurisdictions will support angler educational programs.	Continue	
	3.1.3 VA will monitor bycatch sold as crab bait from the pound net and haul seine fisheries.	Continue	

IMPLEMENTATION MATRIX CONTINUED

Problem Area	Action	Date	Comments
4. Habitat Issues	4.1.1 Jurisdictions will continue to work with the Chesapeake Bay Programs, the Coastal Bay Initiative, and water quality improvement goals for the Bay and coastal areas.	Continue	