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Striped Bass Management in Rhode Island

Thomas N. Fetherston II
University of Rhode Island

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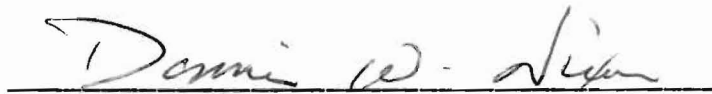
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STRIPED BASS MANAGEMENT IN RHODE ISLAND

BY

THOMAS N. FETHERSTON II

A MAJOR PAPER SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTERS OF MARINE AFFAIRS

A handwritten signature in cursive script, reading "Dennis W. Nye", is written above a horizontal line.

FACULTY ADVISOR

THE UNIVERSITY OF RHODE ISLAND

1991

ABSTRACT

The management of highly migratory marine species is a difficult and complex task. No creature better represents the myriad problems faced by those attempting interstate fisheries management than the striped bass of the Atlantic coast. Their high stock levels in the late 1960s attracted unprecedented attention from commercial and sport fishermen alike. The dramatic crash of these stocks in the late 1970s, subsequent attempts at coastwide management, eventual Federal intervention and finally the rebound of the Atlantic striped bass population is an interesting case study. This paper will focus on what transpired in the State of Rhode Island during this dynamic period. Initially, it will cover background information on the natural history of the striped bass, discuss interjurisdictional fisheries management in general, review the actions of the Atlantic States Marine Fisheries Commission, and finally address the management of the striper in Rhode Island's waters.

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NATURAL HISTORY OF THE STRIPED BASS

One of the most important food and game fishes of our inshore waters, the striped bass (*Morone saxatilis*) has a devoted following wherever it is found. Whether being sought by a caster hip deep in the Point Judith surf, a trap fisherman off Newport, charter boat clients trolling the waters of Cuttyhunk, or a gillnetter in the Chesapeake Bay, the striper is a prized catch. An unpredictable and elusive quarry that fights stubbornly once hooked, the striped bass is a challenging target for the sport fisherman. The firm white flesh of the bass has been in high demand since colonial times. In 1614, writing about life in the Virginia colonies, Captain John Smith said:

The Basse is an excellent Fish, both fresh & salte, one hundred whereof salted (at market) have yielded five pounds (sterling). They are so large, the head of one will give a good eater a dinner, & for daintinesse of diet they excell the Marybones of Beefe. There are such multitudes that I have seene stopped in the river close adjoining to my house with a sands at one tyde so many as will loade a ship of 100 tonnes. I myselfe at the turning of the tyde have seene such multitudes passe out of a pounce that it seemed to me that one mighte go over their backs drishod. (Cole 1978)

The value of the bass as food continues, and it usually commands a good price on the commercial market. In July of 1990, at Larsen's Market in Menemsha, Massachusetts, whole striped bass were being purchased for \$ 2.00 per pound and sold as fresh fillets for \$ 9.89 per pound (personal observation).

The striped bass on the Atlantic coast ranges from the Gulf of St. Lawrence to the St. Johns River in Florida. On the Gulf coast, they

are found in a number of coastal rivers from the Florida Panhandle to Louisiana. (McLane 1974) Striped bass were introduced on the Pacific coast in 1879, when 132 fingerlings from the Navesink River in New Jersey were released into the Carquinez Strait near San Francisco. The bass prospered, and by the turn of the century were supporting a viable commercial fishery. (Stevens 1980) Stripers are now found from the Columbia River in Washington south to Los Angeles, California. The majority of the Pacific population is found in either the San Francisco Bay region or in the vicinity of Coos Bay, Oregon. (Stevens 1980) On its ancestral Atlantic seaboard, the striped bass is most abundant from North Carolina to Massachusetts. Stripers are an inshore fish, frequenting beaches, bays and estuaries, rarely straying further than three miles offshore. There is also a landlocked form of striped bass, arising from a population of fish in the Cooper River, South Carolina that were trapped by the closing of the dam creating the Santee-Cooper Reservoir complex. The freshwater stripers have been widely stocked in large impoundments and now exist in over 400 bodies of inland water (McLane 1974).

The striped bass is a handsome fish, possessing a streamlined yet powerful body that enables it to safely maneuver in the crashing surf it so often frequents. The fish has a long head, a moderately pointed snout, and a projecting lower jaw. The two dorsal fins are of approximately equal length, are separated, and both are triangular in outline. Although the color may vary, the striped bass is generally dark olive-green, steel blue or black on top, becoming silvery on the sides and white on the belly. The sides have 7-8

longitudinal dark stripes that follow the scale rows. The upper stripes are the longest and may reach the caudal fin. The stripes are often interrupted or broken and are usually absent on juveniles less than 6 inches long (McLane 1974).

Striped bass females reach sexual maturity beginning at the fourth year at a length of 18-24 inches and a weight of 4-6 pounds. It was originally thought that all females would be mature by the end of their sixth year, but recent evidence shows some individuals may not reach sexual maturity until their eighth season. Males begin to mature at 2 years and a length of 12-13 inches; all are sexually mature by their third year. Chesapeake fish continue to spawn to the age of 14 years, but elsewhere it appears breeding activity is curtailed after 10 years. A 4-year-old female produces about 65,000 eggs; a 13 year-old may produce 5 million eggs (Austin 1980).

Anadromous in their breeding habits, striped bass ascend rivers from brackish or saltwater. The season usually begins in April in North Carolina or the Chesapeake, but can extend into July for the indigenous St. Lawrence River population. Water temperature is an important factor, and actual spawning may vary as much as a month or more season to season. Spawning begins at a water temperature of 55°-65°, with activity peaking at 65°-67°F. In the Roanoke River, the spawning area consists of rock and boulder-strewn rapids. In the Hudson, it takes place in areas of sand and gravel bottoms and pronounced current. In the Chesapeake, spawning occurs in the upper reaches of brackish estuaries (Austin 1980).

During spawning, a large female bass is surrounded by a number of smaller males. The milt and eggs are deposited in close proximity, and travel downstream some distance suspended in the water column prior to hatching. Hatching occurs in three days at 58°-60°F and in less than two days at 71°-72°F. The yolk sac is absorbed in 6-7 days, and the fry seek the sanctuary of submerged vegetation. (Cole 1978)

At two years of age, a striped bass will be 12-13 inches long and weigh 3/4 pound; at three years the fish will be 23/4 - 3 pounds and 18-20 inches; 5 pounds and 24 inches at four years; 10-15 pounds and 30-32 inches at five years; and 18-20 pounds at 33-36 inches in the sixth year. Bass in their seventh year will average at least 36 inches in length and reach 38 inches in 10-11 years. A 50 pounder is about 50 inches long and is 17-18 years of age. Striped bass have been recorded to 125 pounds at Edenton, North Carolina, in 1891. (McClane 1974)

On the Atlantic coast, there are three main breeding populations of striped bass; those from the Hudson River, the Chesapeake Bay, and the Roanoke River in North Carolina. The migration patterns of each of these groups have been the subject of considerable investigation. It has become apparent that the stripers from each area differ in their migration habits and their resultant contribution to the total striped bass population of a given section of the coastline.

Tagging experiments conducted on the Roanoke population indicate these fish do not undertake significant migrations. Trent and Hassler (1968) studied tag returns of bass from the Roanoke

River and concluded these fish usually remained within Albermarle Sound, straying occasionally into adjacent coastal waters.

Striped bass from the Chesapeake population undertake the longest migrations of any group. Individuals tagged in the Chesapeake have been recaptured off Nova Scotia. In the spring, fish two years old and up migrate out of the bay and head north along the coast. The schools follow the warming inshore waters, arriving off the New Jersey beaches in early April, the south shore of Long Island a couple of weeks later, and begin to show in the Rhode Island surf by the first week in May. The first migrants are generally immature females less than six years old. Kohlenstein (1981) estimated that half of the three year old females from the Chesapeake take part in coastal migrations, not returning to their native rivers until sexually mature. In contrast, most of the young males remain in the bay, along with the remaining young female fish. The second wave of migrants from the Chesapeake leave after spawning takes place. This group is comprised mainly of large, adult females. Merriman (1941) estimated that females made up ninety percent of these individuals. The second wave lags behind the first by several weeks to a month, but the big stripers are usually in evidence in their traditional summer haunts; the Elizabeth Islands and Cape Cod, by the middle of June. The first fall storms in September start the reverse migration pattern, with most of the bass leaving Massachusetts waters by late October, departing Rhode Island by mid-November and arriving in the vicinity of Hampton-Roads, Virginia a month later.

Striped bass from the Hudson River also undertake seasonal migrations, but are generally not as far-ranging as their Chesapeake counterparts. Numerous tagging studies have been performed that indicate the majority of Hudson stripers confine their movements to the length of the river, the New York Bight and western Long Island sound. Raney (et al., 1954) studied the tag return data of the Schaeffer Saltwater Sportsman program from the years 1948 to 1952. The majority of the 9,320 bass tagged were 45cm or smaller in length. Bass tagged in the Hudson were recovered in the southern portion of the river and in western Long Island Sound during the summer. During the winter and spring months the fish apparently remained in the river. A similar study analyzed by Berggren (1966) found that, of 1,917 stripers tagged in the Great South Bay, Long Island between 1956 to 1961, 63% of the tag returns were reported from western Long Island or the Hudson River. In a 1974 report by Texas Instruments on another group of tagged Hudson fish, a majority of the 592 bass returned were captured in the Hudson River or in the waters of western Long Island. Only five of the returns came from outside this area (two from Massachusetts and three from eastern Long Island's south shore). (Klauda et al 1980) Some more recent data, however suggest stripers from the Hudson can make up a significant percentage of the Rhode Island coastal population.

The composition of the striped bass stocks off the coast of Rhode Island has been of interest to state fishery managers, particularly since the serious population decline during the mid to late 1970s. Changes in the relative contribution of the Hudson River

stock to the coastal Rhode Island population will be discussed later in this paper.

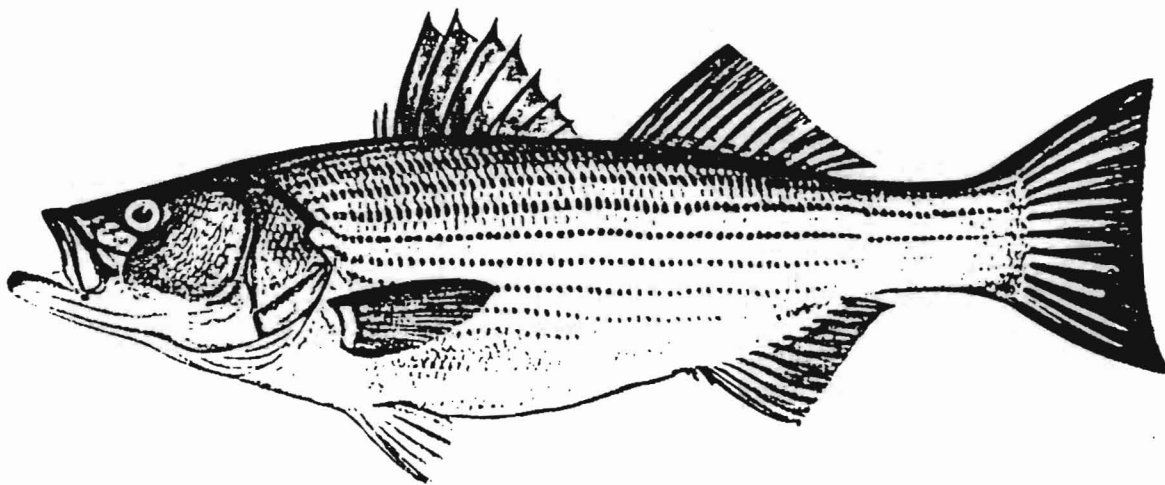


Figure 1. Striped Bass (*Morone saxatilis*) from McClane 1974

COASTAL STRIPED BASS MANAGEMENT PRIOR TO 1981

The value of striped bass as a resource has long been recognized. In 1639, citing their commercial and food value, the General Court of the Massachusetts Bay Colony issued an order prohibiting the use of striped bass as fertilizer "for their grounds". (Cole 1978) Thirty years later, in the same Massachusetts Bay Colony, funds from the sale of stripers were used to construct and finance the first public schools in North America. (Cole 1978) Since those early times, legislation for the protection of striped bass stocks developed within each coastal state. The complicated result of this local level of management can be seen in Figure 4. There is little doubt that such a disparity of regulations and resultant segmentation of striped bass management on the Atlantic Coast proved ineffective when the population crisis of the late 1970s became evident.

Fluctuations in striped bass abundance on the Atlantic coast have been recorded in the past. Because of the lack of complete records, actual numbers are difficult to quantify, but it is generally agreed that an overall decline began sometime after 1885, reaching its lowest level sometime around the First World War. There was some recovery during the 1920s, but it wasn't until the large 1933 and 1934 year classes came into the coastal fishery during the 1936 and 1937 seasons that stripers became a popular target species again. (Cole 1978) Strong year classes occurred at regular intervals through the 1940s, 1950s and 1960s, but the general pattern of a good spawning season every six years or so ended after the excellent 1970 year class. (Fig 2)

The coastwide catch fell sharply from the 1974 season on. The magnitude of the crisis hit home in Rhode Island when the hundreds of anglers participating in the 1977 Rhode Island Striper Tournament failed to produce a single fish! On November 6 of that year, the Providence Sunday Journal, reacting to the Tournament's dismal outcome, ran a headline that read "The striped bass, king of gamefish, may be vanishing from the coast." (Prov Journal, 1977) By 1978, striper stocks were at a 21 year low and declining, with no immediate recovery in sight. Fishermen, biologists and resource managers all along the coast agreed drastic action had to be taken, but the complexity of regulating the harvest of a species that freely migrated through the territorial waters of a dozen states made the task extremely difficult.

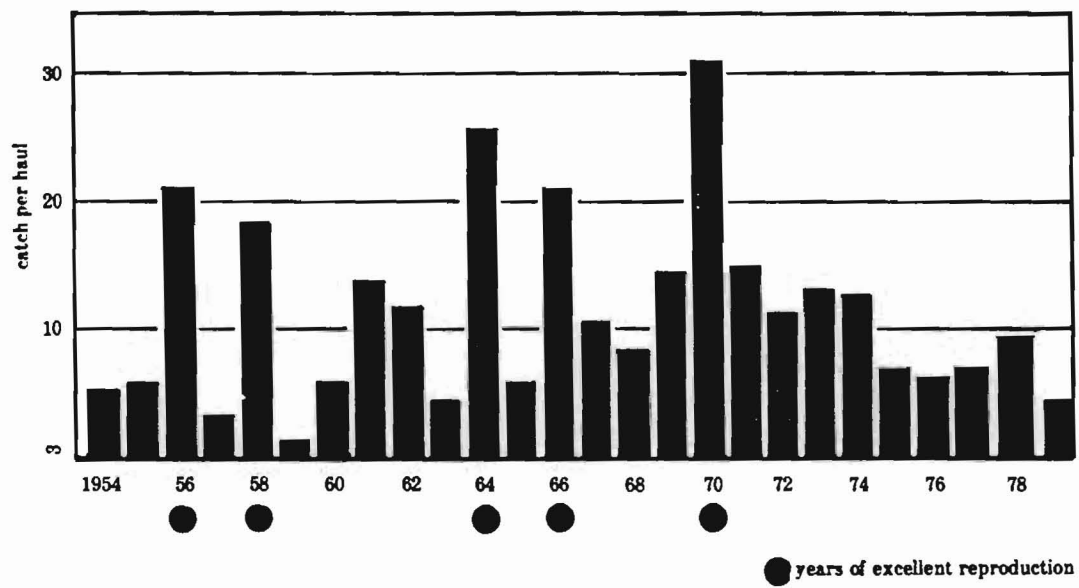


Figure 2. Striped Bass Juvenile Indices, 1954-1979 (Florence 1980)

TRENDS IN INTERSTATE FISHERIES MANAGEMENT

The problems associated with the management of highly migratory species, such as striped bass, are as complex as they are diverse. It became all too evident that developing an adequate management scheme that would be embraced by all the involved coastal states was going to prove extremely difficult.

The Congress has known for some time that the state-federal system in the Marine Fisheries Conservation and Management Act (MFCMA) has caused difficulties. In an oversight report in 1981, the Subcommittee on Fisheries of the House of Representatives found that the councils and the states needed to make greater efforts at coordinating their regulations to prevent potential harm to migratory fishes (ASMFC 1982). Legislation designed to increase management coordination, however, had been limited to certain anadromous species, such as Pacific salmon, and special emergency situations. The Salmon and Steelhead Conservation Act of 1980 (16 U.S.C. 3301-3345) makes federal financial assistance for hatchery and other enhancement programs contingent upon adoption and enforcement of measures recommended to the Secretary of Commerce by a special interjurisdictional commission established under the Act. Similarly, the Anadromous Fish Conservation Act (16 U.S.C. 757a-757g) provides for a 40% increase in the federal contribution toward cooperative programs in states that adopt interstate management plans (ASMFC 1982).

The only situation in which Congress went beyond financial incentives to convince states to adopt approved management plans was in the case of the Striped Bass Conservation Act. In passing the

legislation, Congress cited the "diverse, inconsistent and intermittent State regulation that has been detrimental to the long term maintenance of stocks of the species and to the interests of the fishermen and the nation as a whole" (ASMFC 1985). This perception combined with considerable public concern over the decline in stocks brought about this unusually strong federal action. The drastic Congressional action was foretold by the Minority Counsel to the House Fish and Wildlife Subcommittee, George Mannina, when he addressed the ASMFC in 1982: "...There is no mechanism for forcing cooperation among the States. Should this fail, the voluntary nature of our current program is likely to be replaced by a compulsory system. Whether this system is some form of Federal preemption or another program is unclear. What is clear is that time is running out" (ASMFC 1985)

The Coastal Migratory Fish Conservation Act was another bill sponsored by Senator John Chafee during the 98th Congress. It proposed an institutional arrangement to encourage the coordinated management of inshore species in a manner similar to the MFCMA system for offshore fisheries. States would have been required to implement the management measures adopted by the interstate compact commissions for particular species identified as priorities. They would have been free to adopt more stringent controls. However, the commission standards were to be minimum requirements. Failure to adopt these would have triggered imposition of federal emergency measures.

In spite of the interjurisdictional problems, Congress has never seriously considered removing the states from the Federal

management program under the MFCMA and centralizing responsibility under the Secretary of Commerce. The oversight committees have, in fact, been distinctly non-federal in their consistent support for the regional councils, even in the face of proposed large budget cuts for the federal government system (Rieser 1986). Amendments to the Act have only strengthened the Council's authority in the review of fishery management plans.

Alternative institutional arrangements fall generally into three categories: a federal model, involving more direct federal responsibility for policy formulation, implementation, and enforcement; a state model, where state governments are given greater responsibility for fishery research, policy development, and enforcement, either individually or through interstate compact commission; and a combined state-federal model, one variation of which is the existing council system.

There are numerous options under each category, such as the 0-200 mile or the 3-200 mile regional commissions, and the expanded role of the states or interstate compact commissions. For example, an individual state or group of states could assume responsibility for managing a portion of the FCZ through a delegation of authority from the federal government, similar to the one authorized under the Marine Mammal Protection Act (Rieser 1986). Where vessels from more than one state engage in the fishery, the federal government could condition the withdrawal of federal regulations on the involvement of an interstate commission, the adoption of appropriate state regulations, and the assurance that the residents of different states would be treated equitably.

Assessing the feasibility of such an approach will require examining several related questions, including whether state administrative law requirements prevent interstate cooperation and how they might be overcome throughout federal initiatives such as the Striped Bass Conservation Act of 1984. Also, where federal management has been deferred or withdrawn, as in the case of Atlantic herring, it should be determined whether the states, acting alone or through regional organizations, have responded and whether the fishery has improved without federal management.

The NMFS draft policy on interjurisdictional fisheries (1985) was prompted by perceptions that states are failing to adopt management measures that support regulations implementing the fishery management plans and, to include such issues as habitat protection, research, product quality, and interstate transportation. (Reiser 1986) Its goal would be to transfer more fiscal responsibility, research, and management authority to the states. For interstate territorial sea fisheries, NMFS would act as mediator, assisting states in reaching agreement. By this approach, NMFS seems to be encouraging more federal involvement but less federal responsibility, perhaps one reason OMB reviewers have been reluctant to release a policy statement.

In light of the state-federal regulations since MFCMA, any rethinking of fisheries inter-governmental regulations must begin with consideration of the capacity and willingness of state governments to assume greater responsibility for marine fisheries. One must also inquire whether increased state responsibility can ensure that national interests in fish resources are served.

Whether states are financially and administratively ready to assume a greater role in the management of marine fisheries remains to be seen. A survey conducted by the NMFS (Cookingham 1980) reveals a considerable range in the fisheries management flexibility of the states. (Fig 3) They are also variably dependent on federal assistance for fisheries research and management activities. Thus, the likely reaction of states to federal pressure (through financial incentives or otherwise) to assume more management responsibility will differ. Unlike the pollution control field, however, states have already assumed a significant role in the development of federal policies and regulations through their participation on the regional councils. Thus, a more successful transfer from the federal to the state level may be possible in the fisheries context, at least under carefully controlled conditions.

Table 2. Outline of the regulatory process of each of the coastal states—Maine to North Carolina

State	Regulatory Process
Maine	Regulatory authority vested in the Commission of Marine Resources. there are currently no regulations on striped bass.
New Hampshire	Statutory
Massachusetts	Regulatory authority vested in the Marine Fisheries Advisory Council. Limited regulatory authority has been granted to the Division of Marine Fisheries by the Advisory Council. Current striped bass regulations are statutory.
Rhode Island	Regulatory authority vested in the Marine Fisheries Council. Current striped bass regulations are statutory.
Connecticut	Statutory
New York	Statutory
New Jersey	Regulatory authority vested in Department of Environmental Protection. Marine Fisheries Council has veto power over suggested department regulations. Current striped bass regulations are statutory.
Delaware	Statutory
Maryland	Limited regulatory authority vested in the Maryland Tidewater Administration. Fisheries Advisory Group supplies public and industry input. Current striped bass regulations are statutory.
Virginia	Regulatory authority vested in the Marine Resources Commission. Current striped bass regulations are divided between statutory and regulatory.
North Carolina	Regulatory authority vested in Marine Fisheries Commission. Current striped bass regulations are regulatory in origin.
Potomac River	Regulatory authority for the Potomac River is vested in the Potomac River Fisheries Commission, an interstate agency with governmental and industry representation from Maryland and Virginia. Current striped bass regulations are regulatory in origin.

Source: State/Federal Scientific and Statistical Committee

Figure 3. State Regulatory Structures (Cookingham 1980)

ATLANTIC STATES MARINE FISHERIES COMMISSION

STRIPED BASS MANAGEMENT PLAN-1981

The management regime in place when the Atlantic coast striped bass population crashed in the late 1970s was a patchwork of state regulations tailored to local user group needs with little focus on the overall requirements of the Atlantic coast striped bass stocks. (Fig. 4) To oversee management of migratory species existing within the state's three mile territorial seas was an interstate commission with advisory power, giving the individual states responsibility for implementing the suggested management measures. Established in 1940, the Atlantic States Marine Fisheries Commission (ASMFC) is restricted in its charter to promoting "cooperation and planning" among member states, but has no legal authority to enforce any species management plans it may develop. (ASMFC 1985) As the recent striped bass crisis became apparent, the ASMFC investigated the possibilities available for coastwide bass management. In 1978 the Striped Bass Management Board was established and given the responsibility for developing a Striped Bass Management Plan. (Peterson 1983)

Assessing the stock levels of striped bass along the coast is a difficult proposition. Commercial landings can show trends, but provided dated information. The recreational harvest is extremely difficult to obtain an accurate picture of, so the ASMFC has been judging the relative abundance of the Atlantic Striped bass population utilizing the Young of the Year (YOY) index. The Chesapeake index is the most widely used (Kohlenstein 1980) Seine

hauls are made at specified stations throughout the Chesapeake spawning grounds and the number of yearling striped bass are recorded. (Florence 1980). The validity of this method of relative population strength has been tested a number of times (Goodyear 1985) and has been used as the basis for management decisions by the ASMFC regarding its Interstate Striped Bass Management Plans.

Although preparation of the plan was initiated in 1978, it was not officially adopted by the ASMFC until the annual October meeting in 1981. The major objectives of the plan were as follows:

- Maintain an adequate spawning stock.
- Reduce variation in the annual abundance available for harvest.

(ASMFC 1981)

The strategy used to reach these objectives was to impose a combination of spawning area closures and minimum size increases that would enable females to leave nursery areas prior to their reaching legal size and protect them in coastal waters until they reached sexual maturity. Reaching agreement among member states on how this was to be implemented was difficult due to the contrasting nature of the fisheries in the producer and the coastal states. Producer states, accustomed to harvesting 2 or 3 year old fish and protecting mature females were at odds with the coastal states that traditionally protected juveniles and concentrated effort on the larger fish. (Peterson 1983) The plan was finalized with the following provisions:

- A minimum size limit of 14 inches total length in producing areas of Albermarle Sound, Chesapeake Bay, Delaware Bay and the Hudson River.
- A minimum size limit of 24 inches total length in coastal waters, except for bycatch provisions that:
 - Hook and line fishermen could retain 4 fish per day between the old and the new limits.
 - Net fishermen could retain up to 5 percent of their total daily catch between the old and the new state limits.
- Retention of state-established maximum size limits.
- Closure of major spawning areas to fishing during the spawning season.

(ASMFC 1981)

Compliance with the measures set forth in the plan was voluntary, although prompt adoption of the recommended actions was felt to be vital to the protection of the larger-than average 1978 Chesapeake year group. Due to a variety of reasons, however, the recommended management provisions were not implemented by many of the ASMFC member states, and the 1978 year class was heavily exploited. (Peterson 1983) Some states where Hudson River stock were thought to contribute a significant percentage of the coastal fish, such as Rhode Island and New York, felt the size limits imposed were too extreme. (ASMFC 1984) Other objections stemmed from states that felt they already had stringent regulations in place and it was time their neighbors along the coast made some concessions. Fishermen in the producing states believed the plan placed the bulk of the burden upon themselves with the spawning closures and restrictive size limits. Additionally, there were

instances in which a state would condition its compliance with the plan upon the compliance of other member states. (ASMFC 1984) In the wake of these problems, Amendment 1 was proposed. As initially intended, Amendment 1 was supposed to allow each member state to develop its own approach to striped bass management as long as "equivalent conservation value could be demonstrated" (Weaver et al., 1986). Debate on Amendment 1 centered on two main concerns. The first was that even if one state enacted strong conservation measures, its neighboring coastal states might not. This could result in the neighboring states benefiting from the improved stock status and even negating the effects of stringent controls invoked by the first state making the sacrifices by its fishermen meaningless. The second concern was the public's perception of a patchwork of non-uniform, unequal regulations.

Amendment 1 was approved only after some modification that severely curtailed state's ability to be flexible in the setting of their regulations, which was the point of Amendment 1 in the first place. (ASMFC 1985)

As approved, Amendment 1 stated:

The overall strategy incorporated in the recommended management measures which follow is to reduce fishing mortality in each one of the options considered. The recommended management measures were considered to be the most effective. It may be necessary for some or all of the states to institute additional restrictions, or for some of the states to use other measures in place of the recommended measures. In order to be deemed in conformity with the management measures which follow, the effects of alternate management measures must be quantifiable and reasonably certain of achieving the same reductions in mortality as would

be achieved under such recommended measures. Furthermore, such alternate measures should be submitted to the Striped Bass Management Board of the Interstate Fishery Management Program for review and approval. Alternate management measures shall not include the minimum sizes specified in the plan.

(ASMFC 1983)

The Striped Bass Scientific and Statistical (S&S) Committee, using mathematical modeling, concluded that the plan, as originally drafted, would lead to a doubling of reproductive potential in the Chesapeake stock, although a three-fold increase was required to achieve equilibrium. (Weaver et al., 1986) Stronger measures were obviously required. Talk of the imposition of a complete moratorium occurred, but many felt this would prove unacceptable to too many states. As a compromise, in the fall of 1983 the S&S Committee voted to recommend to the Striped Bass Board that additional regulations were needed in order to effect an overall 55% reduction in mortality over and above that which was achieved by the original plan. (ASMFC 1984) The models projected this would result in enough of a reduction in mortality to achieve a six-fold increase in reproductive potential, twice that required to reach equilibrium. Amendment 2 to the Striped Bass Management Plan, approved by the ASMFC in 1984, stated in part:

- 1) The objectives of these interim restoration measures are to be achieved by all states effecting a 55% reduction, beyond that which would be effected by the base management measures incorporated in this plan.
- 2) To accomplish this, the states are urged to use such measures as catch limits, gear restrictions, seasons, size limits, closures, or elimination of bycatch provisions of this plan's recommended measures. These actions will be evaluated

periodically at the earliest possible time after state proposals are formulated by the Striped Bass Management Board and its Scientific and Statistical Committee to provide findings and recommendations as to whether such measures are true and equitable reductions in fishing mortality.

3) The duration of this interim restoration program shall be until such time as the entire Interstate Fishery Management Plan for striped bass is amended or until such time as the Atlantic States Marine Fisheries Commission amends the Plan by deletion or modification of this section.

(ASMFC 1984)

Evaluating what constituted a "55% reduction in mortality" proved to be a very interesting problem with this amendment of the Plan. Most states had invoked reduced bag limits for recreational fishermen and gear and/or season restrictions on the commercial fishermen. It soon became evident that quantifying the results of these restrictions was very difficult because most states fisheries managers did not have the baseline data (catch-per unit effort, etc.) upon which to base their effects. Assessing state compliance with the Plan was, therefore, often a judgement call by the members of the Commission and not definable on an empirical basis.

Nevertheless, a significant reduction in the mortality of Atlantic coastal striped bass stocks did result.(Boreman & Austin, 1985)

A third amendment of the Plan was drafted in order to protect one of the most abundant year classes observed in the Chesapeake since the mid- 1970s. It was felt the 1982 year class would be vital to the restoration efforts underway, and it should be afforded special protection. Amendment 3 was adopted in October 1985 with the following objectives:

Objective 1: That the states prevent directed fishing mortality on at least 95% of the 1982 year class females, and females of all subsequent year classes of Chesapeake stocks, until 95% of the females of these year classes have an opportunity to reproduce at least once.

This objective is to remain in effect until the three year running average of the Maryland young of the year index reaches 8.0. Management measures suggested to accomplish this goal included:

- Total closure of striped bass fisheries. Where a state whose waters border on or are tributary to those which are closed should take complementary actions to ensure the enforceability of such closures.
- Establishment of minimum size limits below which 95% of females have spawned at least once.
- Establishment of minimum size limits in combination with seasonal closures which insure that sub-adult females are not taken in open fisheries.
- Elimination of any allowable bycatch below minimum lengths.

Such measures need to be made effective prior to the time at which 1982 year class females become exploitable under a given jurisdiction's regulations.

Objective 2: That the Striped Bass Board support restoration efforts in the Delaware River system including Delaware Bay and that a moratorium on striped bass fishing in the Delaware Bay system be implemented upon the onset of restoration efforts.

Objective 1 of Amendment 3, the preservation of the 1982 year class from the Chesapeake, required states to enact step increases in minimum size limits. Minimum legal sizes increased to 25 inches total length in the spring of 1986, and to 33 inches by the summer of 1987.

(ASMFC 1984)

By 1984, there was considerable public concern over the continued decline of the striped bass stocks, and a growing perception that states were not adequately addressing the management recommendations set forth in the ASMFC Plan. The combination of the poor 1983 and 1984 YOY indices from the Chesapeake (ASMFC 1984) and difficulties in convincing some states to adopt the Plan's recommended measures lead to Federal level action. Four different pieces of legislation regarding striped bass were brought before the 98th Congress. After considerable debate, the result was the passage of the Striped Bass Conservation Act of 1984.

State	Permitted catch methods	Size, bag limit, and seasons	Sport license required	Disposition of Catch
Maine	Hand line, rod and reel, or spear only (spear fishing limited to the hours between sunrise and sunset).	None	None	May sell catch.
New Hampshire	Illegal to use seine, weir, or net.	16" fork length (FL)	None	May sell catch.
Massachusetts	Hook and line only.	16" FL	None	Illegal to sell undersized fish. Rod and reel license required for sale of daily catches exceeding 100 lbs. plus 1 fish.
Rhode Island	Hook and line; fish traps between Sept. 1 and Oct. 14; no obstruction to free passage within 150 feet of shore. Nets and seines prohibited.	16" (FL)	None. License required for commercial fish traps.	May sell catch.
Connecticut	Sport fishing only.	16" (FL) minimum. No closed season.	License required upstream from the statutory coastal demarcation line.	May not sell catch if caught in state waters.
New York	Any method.	16" (FL) Closed season Dec. 1 - Mar. 15 in Hudson and Delaware rivers. Nets, seines, illegal in these areas. Superseded by closure order of 1976, prohibiting all commercial fishing in Hudson River between The Battery and Troy Dam, and all fishing between Troy Dam and Fort Edward.	License required when caught in fresh water, except Hudson River to Troy Dam.	May sell catch, except from Hudson River per closure order.
New Jersey	Rod and line and goggle fishing. Netting and other methods illegal except in the Delaware River and Bay where rod and line, haul seines and gill nets are permitted.	Delaware Bay and River between Delaware and New Jersey: 10" (TL) minimum; 20 lb. maximum; size limit. No bag limit or season. Between PA and NJ: 12" (TL) minimum; 20 lb. maximum Open Season Mar. 1 - Dec. 31 All other waters; 18" (TL) minimum size. Bag limit of 10 fish per day. Open season Mar. 1 - Dec. 31.	No salt water license. Required when caught in fresh water.	May sell catch if of legal size.
Delaware	Hook and line, haul seine and gill nets permitted in Delaware Bay and River.	Legal size range 12" (FL) to 20 lbs. for commercial and sport fishing in Delaware Bay and River. In remainder of state, minimum size is 12" (FL). No maximum size. No bag limit. Commercial fishing permitted Nov. 1 - April 30.	None	May sell catch.

Figure 4. Summary of State Striped Bass Regulations - 1980
(ASMFC 1981)

State	Permitted catch methods	Size, bag limit, and seasons	Sport license required	Disposition of Catch
Maryland	All methods except purse seine and otter trawl.	Illegal if less than 12" (TL) or more than 32" (TL). Lawful to have 1 bass per day over 32" (TL) if caught by hook and line except between Mar. 1 - April 30.	No sport license. Must have commercial fishing license to sell or transport across state boundaries, except those caught on hook and line provided no more than 100 lbs. are transported or sold each day.	Permit required for sport fisherman sale of striped bass.
Virginia	All methods	14" (TL) minimum with no more than 2 bass over 40" in one day.	None for salt water. Regular license required for fishing for striped bass in fresh water.	May sell catch.
North Carolina	All methods	12" (TL) minimum. Illegal to fish in New Hanover County. Other county laws may apply.	None	May sell catch

Figure 4. (cont.)

FEDERAL INTERVENTION: THE STRIPED BASS CONSERVATION ACT

In 1979, Congress passed an amendment (P.L. 96-118) to the Anadromous Fish Conservation Act which directed that an Emergency Striped Bass Study be undertaken. Senator John H. Chafee of Rhode Island was the principle sponsor of the legislation, and the amendment has become known as the "Chafee bill". The amendment noted a drastic decline in striped bass populations, and set up an interstate approach to investigate and manage striped bass stocks (Chafee 1980). Specifically, the amendment called for an investigation on the status of striped bass, research to identify the causes for the decline, and an analysis on the economic losses caused by the decline in harvest. The amendment directs annual reports to Congress on the findings of the Emergency Striped Bass Study. These reports summarize the results of investigations on striped bass by federal, state, university and private groups that are funded, in part, under the Emergency Striped Bass Study. The Emergency Striped Bass Study has been responsible for the acquisition of a wealth of new information on the striped bass that has enabled fisheries managers to make informed decisions on protective legislation.

Although the Atlantic States Marine Fisheries Commission adopted their Striped Bass Management Plan in 1981, states were slow to follow the recommended management measures. Continued poor reports from the Chesapeake spawning grounds combined with resistance on the part of several states to adopt effective management measures lead to the belief among concerned members

of Congress that action had to be taken on the Federal level. In 1984, Congress passed the most comprehensive fisheries management legislation since the Magnuson Act of 1976. The Striped Bass Conservation Act (P.L. 98-613), whose principle sponsor was Representative Gerry E. Studds of Massachusetts, has six major provisions. They are, in summary:

1. The Act sanctioned the Interstate Fisheries Management Plan for Striped Bass, including amendments, which was developed by the Atlantic States Marine Fisheries Commission, as the interjurisdictional plan for the management of coastal striped bass stocks from North Carolina to Maine.
2. The Act required review of the plan by the Secretary of Commerce and the Secretary of the Interior and a report to Congress on the plan's adequacy to achieve the conservation of the species. This review was completed on April 30, 1985.
3. The Act established procedures for the review of each state's implementation of the plan. The Commission was charged with deciding, by June 30, 1985, whether each state had taken the regulatory measures necessary to implement the plan within its coastal waters and with reporting any negative determination to the Secretary of Commerce. Based on this notification, the Secretary was required to determine, after consulting with the state in question and the Secretary of the Interior, whether the state was in compliance with the plan and, if not, declare a moratorium on striped bass fishing within the state's coastal waters.
4. The Act called for twice yearly monitoring of state enforcement of the plan, commencing on July 1, 1985, and twice yearly reports to the Secretary of Commerce and the Secretary of the Interior, commencing on 30 December, 1985. It authorized the imposition of a fishing moratorium in a state if implementation of the plan was judged to be adversely affected by ineffective enforcement. As with the initial review of implementation measures, the Commission has responsibility for the original determination of any

enforcement inadequacy which would then be referred to the Secretary of Commerce for a final determination on the imposition of a moratorium.

5. The Act provided penalties for any infraction under a moratorium and provided enforcement authority.

6. The Act required annual surveys of the Atlantic striped bass fishery, including landing data, by the Secretary of Commerce and The Secretary of the Interior.

(ASMFC 1985)

The effects of this legislation on the striped bass and striped bass fishermen will be discussed later in this paper.

ATLANTIC STATES MARINE FISHERIES COMMISSION

STRIPED BASS MANAGEMENT PLAN-1989

The fact that the stocks of coastal striped bass were responding positively to the stringent regulations became apparent by the mid 1980s. Although the YOY index in the Chesapeake remained relatively low, the numbers of striped bass being observed by anglers and watermen all along the coast appeared to be increasing. In order to address the possible recovery of striped bass stocks, the ASMFC saw the need for a new striped bass management plan to cover a period of possible easing restrictions on the taking of bass. A draft striped bass management plan was prepared by Dr. W.A. Richkus working under contract for the Atlantic States Marine Fisheries Commission (ASMFC). The draft was forwarded to the state representatives during March and April, 1989 for their review and comment. Final revisions were made at a board meeting in May 1989, and the final plan was presented to the ASMFC Policy Committee in June and approved by the full Commission in the fall of 1989.

The goal of the plan is "To perpetuate the striped bass resource throughout its range so as to generate optimal social and economic benefits to the nation from its commercial and recreational harvest and utilization over time". (ASMFC 1989) The plan objectives are as follows:

- To restore and maintain self-sustaining spawning stocks, minimizing the possibility of recruitment failure, as determined by Young-of -the-Year (YOY) indices, or other measures of spawning success.

- Promote fair allocation of any allowable harvest among various components of the fishery.
- Adopt standards of environmental quality necessary for the maximum natural production of striped bass and for the utilization of allowable harvest.

(ASMFC 1989)

The plan designates as its management unit "all coastal striped bass stocks of the east coast of the United States north of South Carolina". (ASMFC 1989)

The following items represent the major elements of the conceptual basis for the new management program:

- The revised ASMFC management plan will not come into effect until the Maryland Chesapeake Bay stock is recovered, based on the juvenile index of abundance.
- The revised plan will be based on adaptive management; regulations will be regularly reviewed (annually or biannually) and revised as needed to achieve management objectives.
- Management will be based on target fishing rates (symbolized by the letter F); F represents the rate at which fish are removed from the population by fishermen; target rates are those which will allow stocks to grow and sustain themselves.
- Changes in regulations may be triggered as a result of decreases in reproductive success and of fishing rates being higher or lower than the targeted rates.

(ASMFC 1989)

The following are the key elements of the management approach:

- The plan will go into effect when the Maryland juvenile index achieves a three year running average of 8.0.

- Reaching the trigger (8.0 juvenile index) will initiate a transition management regime; the target fishing rate (F) during transition will be 0.25 (equivalent to the disappearance of 36% of the legal sized fish each year due to fishing as well as natural mortality); this fishing rate was identified as being adequate to allow the stocks to continue to grow to adequate levels.
- If the juvenile index drops below a 3-year running average of 8.0, or if fishing rates are higher than the target rate, regulations would be made more stringent.
- As stocks continue to grow and reach a restored status (based on spawning stock composition and other information), a long-term management regime will be put into place; in this regime, the target fishing rate will be increased to $F=0.5$ (about 50% of legal fish would disappear each year); this would result in further relaxation of the regulations.
- As juvenile production indices for non-Maryland striped bass stocks (Hudson, Virginia, Roanoke) are confirmed and validated, these indices will be integrated into the overall management regime; management regimes will reflect reproductive success in all major centers of production; separate management regimes for non-Chesapeake stocks are acceptable in areas where intermingling of the stocks does not pose a problem.
- If reproductive success declines, or if fishing rates exceed the target level during the long-term management regime, regulations would be made more stringent.
- For both the transition and the long-term regimes, combinations of size limits, seasons and bag limits will be selected which are expected to achieve the target fishing rates; size limits are intended to remain fixed, for the most part, with changes in recreational bag limits and commercial seasons being the primary means of changing fishing rates; such measures for the transition regime are more restrictive than those for the long-term regime.

(ASMFC 1989)

The following are the recommendations of the plan:

Recommendation 1: ASMFC interstate management of striped bass will be implemented using an adaptive management approach; harvest regulations (e.g., commercial fishing closed seasons, recreational bag limits) will be reviewed at least on an annual or biannual basis, depending on the time at which necessary data become available, and adjusted as necessary to ensure that target annual fishing rates are maintained; the review meetings will be held in conjunction with the fall ASMFC annual meeting, with new regulations taking effect in the next calendar year; seasons and bag limits will serve as the primary means of increasing or decreasing fishing rates; juvenile indices will be used as primary triggers for rapid management action (i.e. restrictions on harvest), while deviations in fishing rates or changes in population structure may result in regulation modification on a more regular, long term basis.

Recommendation 2. Two instantaneous fishing rates will serve as target values for this management program; during the transition regime, while stocks continue to rebuild, the target fishing rate will be $F = 0.25$ (approximately 36% of the fish of legal size will be eliminated from the population each year); during the long-term regime, when stocks are fully restored, the target fishing rate will be $F = 0.50$ (approximately 50% of fish of legal size will be eliminated from the population each year); regulations will be changed incrementally in moving from the transition to the long term regime to ensure that target fishing rates are not exceeded; evaluation of whether management targets have been met and determination of actions which need to be taken will be made by the ASMFC Advisory Committee.

(ASMFC 1989)

Another series of recommendations involve situations in which striped bass of different origin exist in the fishery, such as off Rhode Island. Recommendation 6 summarizes the content of the others on this topic.

It states :

Management of coastal stocks of striped bass in areas where stocks are mixed will be guided by the juvenile indices of stocks dominating harvest in such areas; areas within which a single stock contributes 80% or more of the harvest would be managed according to the juvenile index of that stock; areas in which a second stock contributes more than 20% of the harvest (running average over 3 years) would be managed according to the indices of both stocks, with the objective of ensuring that either stock is protected from harvest when the three year running average of its YOY index is below the long term average; boundaries of management areas will be established by the S&S Committee and will be modified as additional stock discrimination data and other relevant biological data are obtained.

(ASMFC 1989)

Size limits called out in the new plan were similar to the previous one in that there is a distinction made between limits in "producing areas" and those in effect on the coast. The following criteria were used to distinguish areas where smaller size limits are allowable:

- Primarily small fish should be available in the defined area.
- Traditional fisheries in the area should have historically targeted small fish.
- The defined area should be one in which fish reside more or less continuously until they join the coastal stock at ages from 2 to 6.

(ASMFC 1989)

In the transition plan, the recommended size limit for Rhode Island is 28 inches, a recreational bag limit of two, and a commercial season selected to reduce the historic harvest rate by 80%. A summary of the state regulations may be seen in Figure 5.

	Proposed Commercial Open Season	Recreational Bag Limit	Minimum Size Limits	Other
	Season selected to reduce harvest rate to 80% of historical rate	1	28	Hook & line only
	No commercial at present	1	28	
	Season selected to reduce harvest rate to 80% of historical rate	1	28	Hook & line only
	Season selected to reduce harvest rate to 80% of historical rate	1	28	Area restrictions on gill and trap nets. If PCB closure remains in effect, then no commercial fishery
	(No Commercial)	1	28	
east)	Season selected to reduce harvest rate to 80% of historical rate	1	28	If PCB closure remains in effect, then no commercial fishery
Hudson)	16 Mar-30 Nov ^a	3 ^{ac}	18	If PCB closure remains in effect, then no commercial fishery
	No commercial at present	1	28	Hook and line and spear fishing only. If PCB closure remains in effect, then no commercial fishery
	Season selected to reduce harvest rate to 80% of historical rate	1	28	Gill net mesh restrictions in March and April
	(No Commercial)	1	28	
apeake Bay)	Season selected to reduce harvest rate to 80% of historical rate	1 ^{ac}	18 ^{ac}	Quota-based system
east)	Season selected to reduce harvest rate to 80% of historical rate	1	28	
	Season selected to reduce harvest rate to 80% of historical rate	1	18	Limited entry, fixed gear only
	(No Commercial)	1	18	
apeake Bay)	Season selected to reduce harvest rate to 80% of historical rate	1	18	Only 2 fish >40"
east)	Season selected to reduce harvest rate to 80% of historical rate	1	28	
east)	Season selected to reduce harvest rate to 80% of historical rate	1	28	
land)	To be determined upon completion of studies and management plan in 1992			

ly one of several acceptable alternatives.

ason and bag limit correspond to F=0.5 since Hudson stock being exploited in this area is at restored status.

Figure 5. State Striped Bass Regulation Recommendations (ASMFC 1990)

STRIPED BASS MANAGEMENT IN RHODE ISLAND

Striped bass management in Rhode Island has epitomized the difficulty faced by fisheries managers attempting to allocate a valuable stock among a number of user groups. In addition, Rhode Island managers have had to contend with competing interests of user groups in neighboring states due to the highly migratory nature of the striped bass themselves. The result has been the establishment of regulations that created considerable controversy between Rhode Island and its neighboring coastal states and between various interest groups within the state.

History

Rhode Island has always been famous for striped bass fishing. Stripers are the glamor fish of its inshore waters, attracting residents and nonresidents alike to its rocky coast. Around the turn of the century, exclusive angling clubs existed around Newport, with private piers built out over the rocks so "sports" using the crude equipment of the day could get their bait or lures out beyond the breakers. The years following World War I saw a significant decline in striped bass stocks all along the coast. (Cole,1978) The striped bass population gradually recovered, with landings reaching record levels in the late 1960s and early 1970s. The high level of abundance experienced during the 60s and 70s made the stripers that much more available and, therefore, more of a target. Although stripers have never been an easy species to take, their high population levels made returning with a good catch more likely. A

number of factors combined to increase fishing pressure on the bass during this time period. Saltwater recreational angling has shown a steady growth in popularity during the past four decades.

Improvements in the technology associated with sport fishing tackle, such as the introduction of the spinning reel, made it easier to attain reasonable proficiency. Fiberglass boats, notably the whole generation of relatively small, fast "fishing machines" put sport fishing vessels capable of serious offshore work within the reach of many people. Electronics routinely available to sport anglers has achieved levels of sophistication never dreamed of only ten years before. (Florence, 1980) The end result was more fishermen fishing more effectively for striped bass than ever.

Surveys conducted by the United States Fish and Wildlife Service indicated a 38 percent increase in the numbers of striper fishermen from 1960 to 1965, an additional 11 percent increase between 1965 and 1970, and a 100 percent increase (to 2,414,000) in 1975. (Ditton 1980) In addition, many "sport anglers" were selling their catch to cash in on the high market value of their quarry. Estimates regarding the effect of this effort indicated that upwards of 70 percent of the individuals of a given year class were being removed by a combination of natural mortality, recreational fishermen and commercial fishermen each season. (Richkus 1989) Not even the healthiest population can survive that predation rate for very long.

Commercial Value

Striped bass have been a valuable commercial species in Rhode Island. Typical gear types have been the floating trap net, trawl

nets, handlines, and, recently, gill nets. The different gear types in use tend to target different sizes of fish. Surveys were taken by the Rhode Island Department of Environmental Management during the 1981 and 1982 seasons to identify what size striped bass were being landed by the commercial fishery. The results revealed trapnets take the smallest stripers, averaging 476mm (18.5"); gill nets average 507mm (19.8") and handlines the largest at 826mm (32.2"). (O'Brien & Sisson, 1982) A summary of commercial striped bass landings in Rhode Island, broken down by gear type, appears in Figure 6. In spite of the dramatic decline in landings in the late 1970s, consumer demand for striped bass actually increased (Fig 7), making the sale of bass even more profitable than before.

Recreational Fishery

The recreational rod and reel fishery accounts for the majority of striped bass landed in the Ocean State. Estimates by the Rhode Island Division of Fish and Wildlife indicate that ninety percent of the striped bass taken in the Ocean State were landed by rod and reel anglers (O'Brien, personal communication). The recreational aspect of this fishery is of tremendous importance to the people of the state, not only as a pastime for themselves, but as an attraction to the tourist fishermen who come from outside the state to enjoy the outstanding striper angling. A travel cost study conducted in 1977 found that 44 percent of the striped bass anglers fishing in Rhode Island were not state residents. The same study estimated the net benefits attributable to the striped bass fishery amounted to \$13.3 million using the travel cost method (Goodreau 1977). In 1979, it

was estimated that anglers in Rhode Island made 181,000 trips for stripers, catching 44,000 fish while spending \$4,119,000.00 (Norton et-al, 1984).

A summary of annual landings of striped bass in Rhode Island since 1954. Landings are broken down into gear type.

Year	Total	Value	Price/lb.	Traps	Handline	Misc.
1980	22	30	\$1.36	7	12	3
1979	54	71	1.31	7	35	12
1978	51	60	1.71	-	26	25
1977	108	84	.78	12	79	17
1976	151	121	.80	13	132	6
1975	305	153	.50	19	263	23
1974	336	114	.34	162	164	10
1973	623	220	.35	365	253	5
1972	309	115	.37	182	109	18
1971	131	39	.29	40	77	14
1970	84	25	.29	18	55	11
1969	132	35	.26	45	74	13
1968	98	22	.22	28	34	36
1967	132	25	.19	68	41	23
1966	250	45	.18	195	42	13
1965	60	11	.18	20	34	6
1964	75	12	.16	20	45	10
1963	71	13	.18	31	22	18
1962	61	10	.16	23	34	4
1961	167	26	.15	126	27	14
1960	77	15	.19	68	8	1
1959	31	7	.22	22	8	1
1958	40	9	.22	27	13	-
1957	21	5	.23	5	13	3
1956	26	6	.23	16	7	3
1955	34	8	.23	24	8	2
1954	108	29	.26	101	7	-

Landings in 1000's of pounds

Value in 1000's of dollars

Price/lb. in dollars

Misc. includes fish taken by dragger and gill nets

Figure 6. (O'Brien 1982)

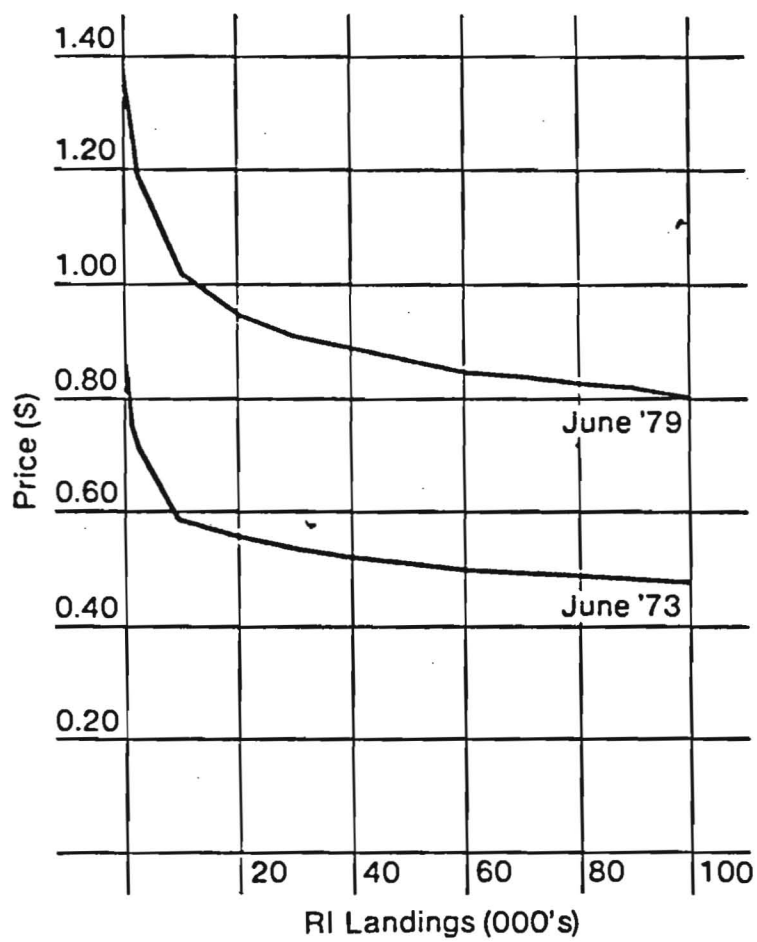


Figure 7. (Strand 1980)

Management History

The first management measure adopted by Rhode Island came about as a result of the low population levels during the 1920s and 1930s. In 1941, Rhode Island adopted the sixteen inch limit recommended by the Atlantic States Marine Fisheries Commission. No additional regulations were levied until 1957, when seasons and area restrictions were placed on commercial operations. (ASMFC, 1990)

The most recent decline of coastal stocks and subsequent efforts by the ASMFC to enact the 1981 Interstate Fishery Management Plan for Striped Bass were the impetus for the many iterations of striped bass regulations that have taken place in Rhode Island over the past ten years.

In 1982, the Rhode Island Marine Fisheries Council addressed the recommendation set forth in the ASMFC Plan for a coast-wide 24 inch length limit on striped bass. Controversy arose when the commercial trap fishermen complained that because the bulk of the stripers they caught ranged in size from 16 inches to 24 inches, a minimum size limit of 24 inches would seriously impact their livelihood. (MRI 1982) (Fig 8) Therefore, in 1982, the regulations passed in Rhode Island called for a 24 inch minimum size for rod and reel anglers, and an 16 inch minimum size for traps and gill nets. A season was established for traps and gill nets, prohibiting their use 31 December through 1 March, and not allowing trap leaders, essential for the taking of striped bass, from 1 September until 28 October. In addition, regulations were passed covering gill nets

Table 3. Fork length frequencies for the total number of striped bass sampled from the Rhode Island Trapnet landing during the 1981 season. Fork length was measured in millimeters.

Midpoint	Freq.	Cum. Freq.	Percent	Cum. Percent
400	16	16	5.25	5.25
425	44	60	14.43	19.67
450	74	134	24.26	43.93
475	45	179	14.75	58.69
500	45	224	14.75	73.44
525	34	258	11.15	84.59
550	16	274	5.25	89.84
575	10	284	3.28	93.11
600	11	295	3.61	96.72
625	2	297	0.66	97.38
650	4	301	1.31	98.69
675	1	302	0.33	99.02
700	2	304	0.66	99.67
725	0	304	0.00	99.67
750	0	304	0.00	99.67
775	1	305	0.33	100.00

Figure 8. (O'Brien 1982)

around Block Island, Sachuest Point, and Narragansett Bay. (ASMFC 1983) The disparity between commercial trap and rod and reel limits caused bitter controversy. Rhode Island Marine Fisheries Council meetings were the forum for the ensuing debates, which largely pitted the commercial trap operators, three of whom sat on the Rhode Island Council as members, against representatives of various sport fishing groups. The battle reached its climax when, in September 1983, a complete moratorium on the taking of striped bass in Rhode Island waters was proposed and adopted, taking effect for three years beginning in January 1984. Sport fishing groups formally complained to the Rhode Island Conflict of Interest Commission, alleging that the commercial representatives had personal financial interests which were "in substantial conflict with the proper discharge of their public duties in violation of Rhode Island's Conflict of Interest Law". (McKinley, 1986) The Commission found that the votes in favor of the moratorium by Council members Mendonsa and Parascondola were acts of "retaliation" meant to impose the same consequences on all striped bass fishermen the proposed 24 inch size limit would have on the trap fishermen. (McKinley 1986) Because both individuals had already received advisory opinions from the Commission that they were in "potential conflict" regarding their votes on striped bass regulations, their latest actions were deemed willful violations of the law. Mendonsa and Parascondola received fines of \$5000.00 and \$1000.00 respectively. (McKinley, 1986) Negotiation between the user groups subsequently took place, and an across-the-board limit of eighteen inches for all angling methods was passed for the second half of the

1984 season (beginning 1 August), with an 15,000 pound quota on the trap net fishery. (ASMFC 1984) The passage of the Federal Striped Bass Conservation Act in 1984 required Rhode Island to conform with the Atlantic States Marine Fisheries Commission recommendations, and the state followed the gradually increasing size limits set to protect the 1982 and beyond year classes, starting with a return to a 24 inch limit for all gear types on 1 August 1985 , and gill nets and trawls were restricted to a two fish per day "bycatch" limit. An additional closed season was established for floating traps from 1 October through 31 October. (ASMFC 1990) The new size limit eliminated the majority of the trap-caught fish from the market, effectively ending large-scale commercial netting for stripers. The ASMFC plan called for the coastwide size limit to increase the following year, and in 1986 the Rhode Island Marine Fisheries Council proposed four possible options for that year's season. They were as follows:

- Maintain the 24 inch minimum length with a two fish per day bag limit.
- Adopt the increasing minimum size limits in the ASMFC Plan calling for one inch incremental size limit increases until 33 inches was reached in 1987.
- Go immediately to a 33 inch minimum size with a bag limit of one fish per angler per day.
- Declare a complete moratorium

(Prov Journal 1986)

The first option would have resulted in the Federal Government imposing a moratorium, in accordance with the provisions of the

Striped Bass Conservation Act. The second option, though in keeping with the plan, was thought to be difficult from an enforcement standpoint. (Prov Journal 1986) The immediate 33 inch limit represented a drastic increase, but would be easier to enforce. The fourth option, a complete moratorium, had the support of the Division of Fish and Wildlife. Jay Cronan, the Director, explained "We had innumerable staff meetings and the consensus is a complete moratorium is the best way to go. If all the states would do this it would take the pressure off the fish and give the stocks a chance to rebuild. If it turns out the stocks don't rebuild with the fishing pressure off we know its not catch mortality but an environmental problem that's responsible" (Prov Journal 1986) During the subsequent hearings, however, representatives of the tourist industry cited the value of stripers to their business and urged the Council not to adopt a moratorium. Eventually, the Council decided to allow anglers to take one fish 33 inches or larger beginning June 1 1986. (Prov Journal 1986)

PCB Contamination

The contamination of striped bass with polychlorinated biphenals (PCBs) in the Hudson River had caused concern among Rhode Island fisheries managers and Health Department officials alike. The fact that many of the striped bass found off the coast of Rhode Island were of Hudson River origin has been well documented. The composition of the striped bass stocks off the coast of Rhode Island has been of interest to state fishery managers, particularly since the serious population decline during the mid to late 1970s. A study

carried out by Berggren and Lieberman (1978) concluded that stripers from the Hudson only exceeded 20% of the coastal population in the western portion of Long Island Sound. Overall contribution of the Hudson stock varies with time of year (Berggren and Lieberman, 1978) as well as year class composition of the migratory population (VanWinkle and Kumar, 1982). Estimates of the proportion of Hudson fish off the Rhode Island coast in 1975 ranged from 13.9% during May and June to 10.3% during July and August to 7.5% in September-October (Berggren and Lieberman, 1978). These figures may have been influenced by the very strong 1970 year class from the Chesapeake Bay. More recent studies involving the discrimination of Hudson stripers from Chesapeake individuals using isoelectric focusing of eye lens proteins were carried out by Saila et al. (1983). The purpose of these investigations was to determine the relative contribution of Hudson River striped bass to the Rhode Island trap fishery. Stripers used in the study were captured off Newport during a 10 day period in November, 1982. It was found that 33 percent of the 103 fish tested were Hudson stock. The authors cautioned that this sample was taken over a relatively short time period, but it did seem to indicate that Hudson River striped bass could make up a significant proportion of Rhode Island's coastal stocks. The stock studies continued in Rhode Island, and the following year three samples were made (Fig 9). The seasonal variation in percentage of Hudson fish is apparent, with the spring seeing the largest numbers. The sampling conducted during the spring of 1986 (Fig 10) gave further verification of this trend.

Classification results of the growth invariant discriminant function analysis for discriminating the Hudson River group from the pooled Chesapeake Bay-Roanoke River ('Southern') group and obtained from the coastal population samples.

Collected from:	<u>NUMBERS AND PERCENT CLASSIFIED AS:</u>		
	<u>HUDSON RIVER</u>	<u>'SOUTHERN' GROUP</u>	<u>TOTAL</u>
Rhode Island			
Fall 1983	4 3.60%	107 96.40%	111
Spring 1984	22 22.92%	74 77.08%	96
Fall 1984	22 7.28%	280 92.72%	302

Figure 9. Classification Study Results, 1983-1984 (Saila et.al. 1983)

Classification of coastal samples from spring 1986 using the growth invariant discriminant function^a of Fabrizio and Saila (1986). Classifications reported as percentages.

	<u>CLASSIFIED INTO:</u>		<u>N</u>
	<u>HUDSON</u>	<u>SOUTHERN</u>	
Rhode Island	67.6 %	32.4 %	145
Long Island	89.3 %	10.7 %	28
Massachusetts	85.0 %	15.0 %	20
Lower Hudson River	82.8 %	17.2 %	29

Figure 10. Classification Study Results, 1986 (Fabrizio 1987)

Rhode Island fisheries biologists had been monitoring the PCB levels of striped bass caught off the Rhode Island coast since 1982. Working cooperatively with the New York Department of Environmental Conservation, samples of stripers were sent to Hazelton Laboratories in Madison, Wisconsin for analysis. (Gibson & O'Brien 1987) Individual fish were weighed, measured, sexed and their PCB concentration in parts per million recorded. The results were analyzed over a period of four years and then published by the Division of Fish and Wildlife. (Gibson & O'Brien 1987) On 7 April, 1986, the Rhode Island Department of Health, reacting to data presented regarding the levels of polychlorinated biphenals (PCBs) found in Rhode Island striped bass (Fig 11), banned the sale of the fish in the state. (Prov Journal 1986) This ended remaining commercial pressure on the bass.

Additional Measures

Another size limit increase occurred on 1 January 1989, when the minimum went to 36 inches, and finally, to 38 inches on 1 January 1990. (ASMFC 1990)

Implementing the 1989 ASMFC Plan

As previously noted, the long range management plan for striped bass approved by the ASMFC included the graduated increase in minimum size for stripers to protect the 1982 and beyond year classes until one hundred percent of the females had the chance to spawn and the YOY index reached 8.0 for three years in a row. Recent research had indicated that some females did not reach

A summary of basic statistics for Rhode Island PCB samples. 1982-1986.

Year	Season	Samp. Size	Mean Length (mm)	Mean PCB (ppm)	Geometric Mean PCB (ppm)	Range (ppm)
1982	Fall	25	519.0 ± 87.0	1.21 ± .62	1.10	.38 - 3.18
1983	Fall	24	496.4 ± 67.3	3.35 ± 11.06	1.12	.30 - 55.20
1984	Spring	24	430.3 ± 123.2	1.18 ± .83	.83	.22 - 3.14
	Fall	26	513.8 ± 78.9	1.23 ± .60	1.16	.42 - 2.36
1985	Spring	25	606.2 ± 163.6	3.01 ± 1.88	2.42	.77 - 7.29
	Fall	24	602.1 ± 138.1	2.14 ± 2.64	1.43	.30 - 13.56
1986	Spring	30	734.8 ± 252.8	2.83 ± 7.46	1.67	.15 - 40.70
	Fall	21	736.4 ± 325.3	1.70 ± 2.22	1.21	.50 - 9.20

Table 2

ANOVA Results—PCB Analysis.

Source	d.f.	s.s.	m.s.s.	F
Years	2	2.541	1.270	1.137
Seasons Within Years	3	3.353	1.118	1.299
Sexes Within Seasons	6	4.620	.770	4.373**
Determinations	132	23.240	.176	----
Total	143	33.754	----	----

**Significant at P .01

Figure 11. (Gibson 1987)

sexual maturity until their eight year point, so the 38 inch limit was enacted to ensure one additional season of protection for the 1982 fish. In the ASMFC management plan drafted in 1989, the schedule for the easing of restrictions on the fishery was delineated. Specific triggers were cited as initiating the process of relaxing size, creel and commercial restrictions on the striped bass. At the time the document was drafted for approval, the primary trigger, the YOY index in the Chesapeake, was not anticipated to be attained until 1991. However, the surveys completed in 1989 indicated spawning success so great that the desired YOY had been exceeded that season. (ASMFC 1990) Fisheries managers all along the coast had to then reevaluate their proposals for striped bass size limits for the 1990 season. The management plan approved by the ASMFC in October 1989 contained guidelines for each state regarding the regulations that would apply within its territorial waters in the event of the attainment of the required YOY index. Rhode Island had adopted the recommended 28 inch limit for coastal waters, with a bag limit of two fish per angler per day. A limited commercial season was proposed, running 15 May through 15 June, and again from 15 September through 15 November. (ASMFC 1989) Area restrictions were noted for traps and gill nets, but no mention was made of any total catch quotas. These were preliminary regulations, and at the time the plan was approved, a move to the relaxed regulations was not anticipated until 1991 at the earliest. When the YOY index for 1989 was calculated, however, the 25.0 level far exceeded what was required to trigger the implementation of the new regime. (ASMFC 1990)

Rhode Island, like the rest of the coastal states, found itself in the position of having to solidify regulations under the new management scheme one year earlier than anticipated. In establishing what Rhode Island's striped bass regulations would be, fisheries managers had to weigh a number of factors.

Solving the user group conflict issue in the allocation of the resource was a problem compounded by several situations. First of all, as state resource managers, it was their charter to "Promote fair allocation of any allowable harvest among various components of the fishery" (ASMFC 1989). Although there was tremendous pressure from various sport fishing organizations, the fishery managers had to objectively address whether some form of commercial exploitation of the stocks could take place. The fact that neighboring coastal states were either planning or currently engaged in commercial fishing for striped bass had to be considered.

Commercial Fishing in Massachusetts and New York

The Commonwealth of Massachusetts has openly been critical of the Rhode Island size limits for trap fishermen. However, throughout the recent population crisis, the Bay State continued to allow commercial fishing. Although Massachusetts eliminated netting in 1947, a commercial rod and reel fishery, concentrating on large individuals has been in effect. (ASMFC,1989) The majority of the effort occurs around the Elizabeth Islands, Martha's Vineyard and the outer Cape. The minimum size limits for this fishery have increased in accordance with the ASMFC management plan, so the fish reaching the market have been large, pre-1982 individuals,

probably migratory females from the Chesapeake population. Massachusetts has regulated this fishery by means of a catch quota, but the fact remains that large numbers of spawners were removed from the coastal population every year. One Massachusetts commercial fisherman sold just over 20,000 pounds of stripers in the 1988 season, and each of these fish had to meet the 1988 Massachusetts minimum size of 33 inches (Thomas Carroll, personal communication). The results of one particularly productive morning at Cuttyhunk are shown in Figure 12. When Massachusetts managers call for continued high size limits, they may do so knowing that their state's commercial fishermen will not seriously be affected. Their striped bass plan called for a minimum size of 36 inches for 1990 with a quota of 232,000 pounds.

Commercial fishing for stripers in the State of New York historically took place in the Hudson River and the south shore of Long Island. Gill nets were the primary gear used in the Hudson, but along the Long Island shore, traps, haul seines, and rod and reel methods were also used. Here the emphasis was on smaller fish for the New York City restaurant trade and private consumption. (ASMFC 1981) The small bass in the three to five pound range, called "selects", commanded two to three times the price that the larger individuals did. Netting in the Hudson was stopped in 1976 due to PCB contamination, but commercial fishing continued on Long Island until 1986, when stripers large enough to be taken under the increased size limit exceeded the Federal PCB limit. (The Fisherman 1990) The apparent success of coastwide management measures caused New York fishery managers to reconsider opening the Long



Figure 12 Fifty stripers up to fifty-one pounds caught one morning off Cuttyhunk, August 1988

Island commercial season on a limited basis. Their problem remained how to deal with the possibility of contaminated Hudson River fish entering the market, yet protect the migratory Chesapeake fish. Sampling had shown that stripers taken in the fall from the waters of eastern Long Island possessed lower contaminant levels than those taken in the spring and summer. The solution was to set a season for the east end of the Island in the fall, with a "slot limit" of 24 to 29 inches, targeting individuals that had spawned at least once but were under the size that could contain a PCB level higher than the FDA maximum. The quota established was 128,000 pounds for the 1 September through 15 December season. Recreational fishermen were allowed one fish of 28 inches per day. (The Fisherman 1990)

Development of Rhode Island's Regulations

Rhode Island managers, therefore, noted that their neighbors up and down the coast were either currently commercially exploiting bass or proposing to do so. It seemed fair for Rhode Island commercial fishermen to share in the commercial exploitation of the once again abundant bass resource to a least the same extent that the commercial fishermen in Massachusetts and New York were.

John F. O'Brien, Deputy Director of the Division of Fish and Wildlife for the State Of Rhode Island and manager of the state's striped bass fishery, discussed the various aspects and associated difficulties in implementing the new ASMFC plan during an interview in July 1991. .

The first major problem related to re-opening the fishery was the Department of Health prohibition on the sale of striped bass due

to PCB contamination. Annual surveys had been taken by the Rhode Island Department of Environmental Management to assess PCB levels in striped bass from state waters since 1982.(O'Brien and Sisson) Individuals were measured and weighed prior to testing, and these figures recorded along with the eventual PCB level found in that fish. After examining years of data, a relationship was found between length and average PCB level that was not anticipated. While the concentration of PCB did increase with size as would be assumed, after an individual attained approximately 40 inches in length the average level gradually fell off. Although it is yet to be proven, a hypothesis exists that the large fish, which are almost all female, shed much of their accumulated PCBs during the spawning process. PCBs tend to concentrate in fatty tissue, and the gonads are typically an area to which these compounds will migrate from other parts of the body. As large, mature female fish participate in spawning activities each year, they gradually lower the level of PCBs in their bodies. (O'Brien, personal communication) The data showed stripers in the 26 to 40 inch range to have the greatest potential for PCB contamination in excess of the Federal maximum of 2 parts per million. When presented with these findings, the Rhode Island Department of Health agreed to allow a commercial season if the DEM could ensure fish entering the market would not fall between that 26 to 40 inch range. (O'Brien, personal communication)

Allocation of stripers in the acceptable sizes among the various gear types used in the commercial fishery was the next issue that needed to be addressed. Historical use was the criteria

chosen to decide which methods would be allowed. A review of commercial landings records showed trap nets, otter trawls and handlines contributing to the landings for years, but gill nets only began appearing in 1975. It was therefore decided to eliminate gill nets as a gear type and divide the allowable take between traps, trawls and handlines (O'Brien, personal communication)

Amendment 4 of the Striped Bass Fisheries Management Plan called for allocation of a commercial quota that represented 20 percent of the state's average commercial landings for the years 1972 through 1979. In calculating the Rhode Island quota, a more conservative long term average, representing the years from 1972 through 1985, was used. Using the annual landings from Figure 6, an average of 198.9 thousand pounds of striped bass was landed per year. The target level of 20 percent equals 39.8, rounded up to 40 thousand pounds as the annual quota.

As noted earlier, the trap fishery tends to take smaller fish with an average size of approximately 18.5 inches. As other states with "historical" fisheries for small individuals were allowed an 18 inch minimum size, and the Rhode Island Department of Health would permit the sale of stripers under 26 inches, it was believed the trap fishermen could be given a portion of the commercial quota. Again, the amount was calculated using trap landings from 1972 through 1985 to determine an average annual harvest. The trap fishery averaged 81.7 thousand pounds per year during that period. Taking 20 percent of that number results in a 16 thousand pound quota. Because of the size of the fish involved, the quota was reduced to 15 thousand pounds. (O'Brien, personal communication) In addition,

Rhode Island fishery managers reduced the overall quota for the state to 35 thousand pounds to ensure the stocks would not be over-exploited. The final allocation is therefore 15 thousand pounds for the trap net fishery (18 to 26 inch fish) and 20 thousand pounds for the handline and trawl fishery (fish 40 inches or greater).

The final question to be addressed regarding the commercial quota was that of management. To ensure that the quotas were adhered to, some form of harvest control mechanism had to be in place. Non-removable jaw tags were decided upon as the most effective means of limiting striped bass harvest. To determine the number of tags to be issued, the average weight of a bass from each quota group (trap and handline/trawl) had to be determined. A typical weight for stripers from the trap fishery was found to be 3.6 pounds, based upon historical data. Dividing 15000 pounds by 3.6 pounds equates to 4155 individuals, so that is the number of tags issued total. (The Fisherman 1990) Dividing that figure by the six operating fish trap companies results in an allocation of approximately 692 tags per company. (O'Brien, personal communication) For the large fish, tags were divided among seafood dealers, who must keep a running record of the number of pounds of stripers sold. No striped bass may be offered for sale in Rhode Island without a jaw tag, and records of individual weights and lengths must be made each time a tag is issued. The trap net fishery must cease when all 4155 tags are used, and the handline/trawl fishery will cease when the 20000 pound quota is reached. (O'Brien, personal communication)

The size and bag limits imposed upon the recreational fishermen were in accordance with the ASMFC Plan: one bass per day, minimum size 28 inches.

Predictably, many recreational fishermen were displeased with the decision to allow commercial fishing. Various editorials and letters in the *New England Fisherman*, a weekly sportfishing newspaper, called the new regulations a "sell-out" and a "rape of the resource" (The Fisherman 1990). An editorial in the 5 April 1990 edition of that publication viewed the data supplied by the Rhode Island Division of Fish And Wildlife with skepticism and concluded "Rhode Island recreational fishermen are outraged and plan to take action to overturn these short sighted decisions" (The Fisherman 1990). Ironically, in the early part of the same article, the writer praised Massachusetts for retaining a 36 inch limit for their commercial fishery, somehow missing the fact that they were planning on taking over fifteen times what had been allotted to the Rhode Island trap fishermen. In spite of the initial debate, active dispute over the proposed regulations gradually ceased. When presented to the ASMFC, the council members approved the Rhode Island plan, and it went into effect on 26 July 1990. (RIDEM 1990)

The fact that striped bass are once again present in healthy numbers is noticeable throughout their range. Nowhere is the remarkable comeback of the bass more evident than in the coastal waters of Rhode Island. From the seemingly hopeless days of the late 1970s through the early 1980s, when seeing one striper a season was an accomplishment, their numbers grew to the point where, during the 1990 season, not catching a striper during a trip

was unusual. That the fish are back is undisputable, but what is hard to quantify is the actual population size and the fishing related mortality. Because there was no commercial season in Rhode Island for four years, and the take was very restricted for 1990, data on commercial landings cannot be used as an indication of the stock level. Estimates based on creel surveys of recreational fishermen are also not representative of the numbers of bass, due to the relatively large size limit and restricted (one fish per day) bag limit. A better idea may be obtained by examining the fishing logs some sport anglers and charter skippers maintain, or looking at landing receipts from commercial rod and reel fishermen operating in the neighboring waters of Buzzard's Bay and Martha's Vineyard. One surf fisherman, Dave Pickering, who concentrates his efforts along the south county beaches, took 124 stripers in the 1984 season in 112 trips. In 1990, he made 134 trips and landed 1094 bass, an almost tenfold increase in six years (Pickering, personal communication). The author's logs also demonstrate the trend. In 1983, one six pound striper was landed during the entire season. In 1990, he fished an average of two days per week during the months of July, August and September. Although these are traditionally the slowest months of the season, an average of five striped bass per trip were landed, and there was only one trip during which no stripers were taken.

Summaries of the data from last year's short commercial season were not indicative of the striper's true abundance, according to John O'Brien. Approximately 1000 pounds were landed by the trap net fishery, and approximately 3000 pounds by the handline/rawl

fishery. (O'Brien, personal communication) The initial indications are that the 1991 season is much more productive, with all but one of the trapnet companies using most or all of their tags, and 12,000 pounds landed in the handline/trawl fishery as of July. (O'Brien, personal communication)

The the difficulties faced by the State of Rhode Island in developing a management plan for the harvest of striped bass within its territorial waters were, in many ways, analogous to those experienced by fisheries personnel, resource managers and legislators in all the Atlantic coastal states. The complex issues of migratory stocks, chemical contamination and competing user groups had to be addressed by Rhode Island's fisheries managers as issues with the other coastal states and within the borders of Rhode Island itself. Although developed by personnel under considerable pressure from organizations representing the recreational and commercial interests, the current regulations appear to be the most objective, rational approach to ensure the harvest of striped bass is fairly allocated among the citizens of Rhode Island, while ensuring the fish themselves are protected from excessive exploitation.

The restoration of the Atlantic coast striped bass is a unique fisheries management success story. From dismal population lows, the fish have recovered to the point at which they may once again support a limited, yet more sensible, commercial and recreational harvest. Arriving at the management scheme that made this possible was a difficult and painful process for Rhode Island, but the dedication of people from many disciplines prevailed. Hopefully,

with continued careful oversight, striped bass will continue to be a valuable resource to the people of the Ocean State.

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