MARINE FISHERIES OF NEW YORK STATE[1]

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ABSTRACT

Review of the history of landings of fish and shellfish in the State of New York shows that the record since 1880 can be divided into three periods. The first was a period of development of coastal fisheries in shallow waters, which ended about 1930. The second, which lasted until the early 1950s, was a period of extension to fishing grounds farther offshore, the era of the trawl fisheries. The third was a period of steady decline in landings, still under way, characterized by a return to inshore resources.

The 90-year record has seen the rise and virtual collapse of the industrial fisheries of the State, steady decline of the oyster industry to a relatively minor status, and growth and decline of many other once-important fisheries. The variable level of total annual landings has been maintained by constant shifting from one resource to another as the stocks of each have declined in turn. This is a classic example of the evolution of a coastal fishery under a regime which offers no effective management.

Popular opinion is almost unanimous in blaming foreign fishing for the ills of the domestic fisheries. It is believed that unilateral extension of national jurisdiction would remedy the situation. In reality, although foreign fishing is not without effect, it impinges on relatively few of the coastal fishery resources of New York State. The major problems are domestic, and they will be most difficult to solve.

It seems particularly appropriate, in a volume which honors Dr. O. E. Sette, to discuss the marine fisheries of one of the northeastern States. It was in this general area that he did some of his earliest and best known scientific work, on *Scomber scombrus*, the Atlantic mackerel (Sette, 1930a, 1930b, 1931, 1932, 1933a, 1933b, 1934, 1938, 1943, 1950). It also is appropriate to use as basic data for this paper the published historical statistics on commercial fish catches, because for about 6 years Dr. Sette was Assistant in Charge of the Division of Fishery Industries in the United States Commission of Fisheries. In this capacity he was author of the annual reports of the Federal Government on commercial fishery landings (Sette, 1925, 1926a, 1926b, 1928; Sette and Fiedler, 1929).

When Dr. Sette first became responsible for gathering and publishing statistics on the commercial fisheries of the United States, only a few surveys of landings had been made and published. These began with data for 1880 and represented a few, usually widely scattered, years. The precision and completeness of these early records is questionable; but, when Dr. Sette began to gather the data for 1923, his well-known concern for accuracy and thoroughness began to be felt and his tenure in the 1920s marked the beginning of an almost unbroken series of annual reports on many aspects of the commercial fisheries of the United States, including landings by weight and value for each of the States.

Gathered, as they must be, by various indirect methods and by a relatively small force of field agents, these data cannot be completely accurate. It is obvious also that total landings are not very good indices of abundance of a species, for abundance can vary from many causes, such as changes in demand, or fishing effort, competition from other fisheries, and other economic forces. Yet no one would challenge seriously the value of these data as general indicators of trends in the fisheries and even as gross indicators of changing abundance. It is surprising that

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commercial landings have not been used more frequently to describe the condition of the fisheries of an area, for, used with caution and with an understanding of their limitations, these statistics can be most revealing (McHugh and Bailey, 1957). Considered in conjunction with existing knowledge of the biology and life histories of the stocks of fish and shellfish, they also can be valuable background materials for planning research, development, and management of the fisheries and the resources upon which they depend.

For these reasons, on beginning to examine the fisheries of a region it is useful to turn to the published record. It is not enough to consider total landings. The history of each fishery must be examined, for the species composition of the catch may be very different at different points on the time scale. For example, in the State of New York, as in many States, the ranking of species in landed weight in 1880 was greatly different than in 1970. American oyster (*Crassostrea virginica*), the dominant food species in 1880, was a very minor component of the catch in the 1960s. Surf clam (*Spisula solidissima*), not recorded in the catch until about 1900 and a minor resource until about 1950, now dominates.

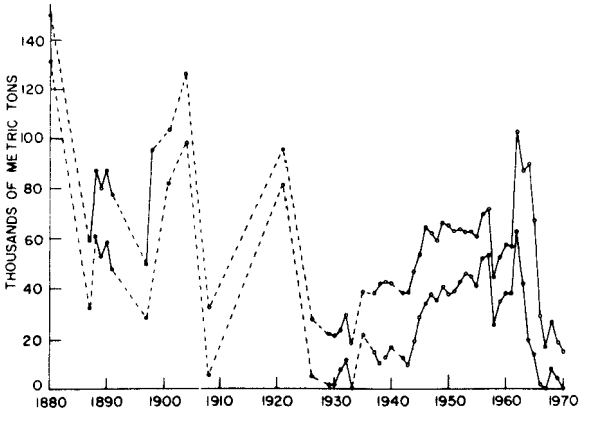

FIGURE 1.—Total annual commercial landings of fish and shellfish in the State of New York, 1880-1970. The lower line is the menhaden catch. In this, as in the other figures, broken lines have been used to join points between which one or more years' data are missing.

Examination of catches of a few years, selected at more or less regular intervals over the 90-year period, is not adequate to tell the whole story. Inevitably, some species, which were important for a while and then declined in their contribution to the total catch, will be missed. It is necessary to study the catch by species or by stock of fish for all years in which data are available. The work of Dr. Sette and his colleagues about 35 years ago, in improving the basis for collection of commercial catch statistics, has made this possible. The story that these records tell is most revealing in the light of present problems of the coastal fisheries and the steps that have been proposed to solve them.

I am indebted to Miss Karen Henrickson for her careful preparation of the illustrations.

HISTORY OF TOTAL LANDINGS IN NEW YORK

To analyze total landings intelligently the data must be separated into at least two subsets. In many coastal States, especially along the Atlantic and Gulf of Mexico coasts of the United States, industrial fishery resources dominate the marine commercial fish catch, and the history of total landings is largely a history of the industrial fisheries, primarily Atlantic menhaden, *Brevoortia tyrannus* (Figure 1). Total landings of food fish and shellfish have had a different history, which for New York apparently can be separated into three phases (Figure 2).

The first such phase, covering 1880 to 1926, was characterized by wide fluctuations in food fish landings in the State. Data are available for only nine scattered years, and their accuracy is not known, especially for the early years. The peak year in this period was 1908, with a reported food fish catch of about 54 million pounds (24,500 metric tons). More than 88% of this catch consisted of 13 genera: American oyster, weakfish (*Cynoscion regalis*), sea mussels (*Mytilus* and *Volsella* spp.), flounders (probably mostly summer flounder, *Paralichthys dentatus;* winter flounder, *Pseudopleuronectes americanus*; and yellowtail flounder, *Limanda ferruginea*), bluefish (*Pomatomus saltatrix*), Atlantic

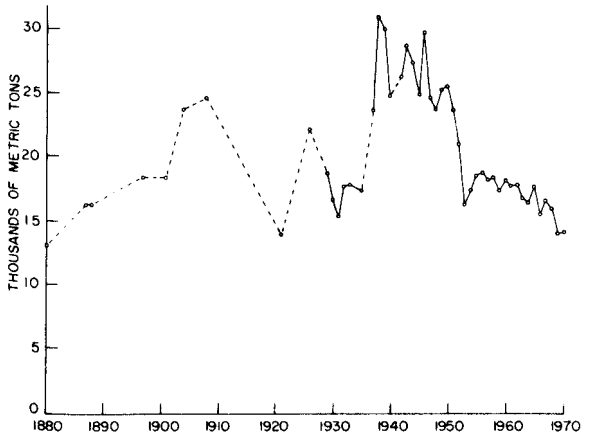

FIGURE 2.—Annual commercial landings of food fish and shellfish in the State of New York, 1880-1970.

cod (*Gadus morhua*), hard clam or quahog (*Mercenaria mercenaria*), scup (*Stenotomus chrysops*), butterfish (*Peprilus triacanthus*), and black sea bass (*Centropristis striata*). The low year, except for 1880, was 1921, with a reported catch of about 31 million pounds (14,000 metric tons) of food fish and shellfish. About 73% of these landings consisted of oyster, flounders, weakfish, scup, bay scallop (*Aequipecten irradians*), bluefish, northern lobster (*Homarus americanus*), hard clam, cod, and butterfish. The decrease was caused largely by sharp drops in landings of weakfish and mussels, and substantial drops in oyster, cod, and bluefish landings. By 1926 food fish landings had increased again to about 49 million pounds. The increase was mostly haddock (*Melanogrammus aeglefinus*), but landings of flounders and cod increased also. These increases were partially offset by a substantial drop in oyster production, but landings of weakfish, bluefish, and lobster dropped too.

The second phase was from 1929 to 1951. Landings were reported for almost every year of this period, which was marked by a sharp increase in food fish landings from 1935 to 1938, a 15-year period in which average annual food fish landings were about 58.4 million pounds (26,500 metric tons), and an equally sharp decline from 1950 to 1953. Most of the increase from 1935 to 1938 was caused by an increase in landings of haddock, cod, flounders, silver hake (*Merluccius bilinearis*), and butterfish, species caught primarily in trawls. Production of oyster meats also increased by nearly 4.5 million pounds (2,000 metric tons) from 1935 to 1938, as the highly mechanized oyster planting industry reached its full development. This almost doubled oyster production in the State and introduced a period of prosperity in the local oystering industry which lasted for more than 15 years.

The years of highest landings of food fishes in New York State, 1938 to 1946 inclusive, were unusual years for the fishing industry everywhere. Toward the end of this period, especially, demand for fish was high because meat rationing was in effect in the later years of the war. No price controls or rationing were imposed on fishery products. Thus, fish prices were high, and the incentive to go fishing was great. For 11 of the 13 years between 1938 and 1950 inclusive New York landings of food fish and shellfish were greater than ever before or since in recorded history, and it is probable that this could be said of 1941 also, a year in which no record of landings was made. The abrupt drop in landings which began after 1946 probably was stimulated by three factors, declining prices of fish as meat became more available after the war, increasing costs, and declining abundance of some of the major species.

Declining abundance of some species was becoming evident during the war. Although demand for fish was high, and prices good, the species composition of the catch was changing during this period of maximum landings and increased fishing effort. Catches of cod, flounders, haddock, butterfish, and sea scallop dropped substantially, and oyster production was down considerably also. The high levels of catch were maintained by increases in landings of hard clam and surf clam, northern puffer or swellfish (*Sphoeroides maculatus*), weakfish, and scup. Thus, the fisheries of the State were shifting from resources taken mainly on the high seas to species of the coastal zone.

The third phase, from 1952 to 1970, was a period of gradually declining landings. In the

first 10 years of this period the average annual landings of food fish and shellfish were about 40.4 million pounds (18,300 metric tons), and in the last 9 years about 35.7 million pounds (16,200 metric tons). Species which during the war began to contribute less to the catch continued in general to decline in importance; but the most spectacular declines were the virtual collapse of the two most important fisheries of the State, the oyster and menhaden industries.

INDUSTRIAL FISHERIES

Industrial fisheries have been relatively important along the northeastern Atlantic coast of the United States for a long time, although the peak of landings was not reached until about 1955. The principal species, and for most of the period of record the only industrial fishery resource of importance, has been the Atlantic menhaden. The period of greatest development of the Atlantic coast menhaden fishery came with the decline of the Pacific sardine (*Sardinops sagax*) fishery on the Pacific coast. Indeed, the recent history of menhaden landings shows a remarkable parallel to the rise and fall of the Pacific sardine fishery, with a time lag of about 20 years (McHugh, 1969b). There is no reasonable room for doubt that the principal cause of the decline in the Atlantic menhaden fishery was overfishing, as has been established for the Pacific sardine fishery (Murphy, 1966). It would have been prudent, for want of better information, to manage the menhaden fishery in the light of the extensive historical and scientific knowledge of the sardine resource, but for various reasons this was not done. The work of Dr. Sette and his associates on the sardine resource and its fishery (see, for example, Sette, 1969) could have provided valuable guidance for research and management of menhaden fishing if it had been heeded on the Atlantic coast. The Federal Government program on the Pacific sardine was started by Dr. Sette in 1948, and the results of this work, coupled with extensive studies begun much earlier by the State of California, have provided detailed documentation of the effect of fishing on the sardine resource. Although

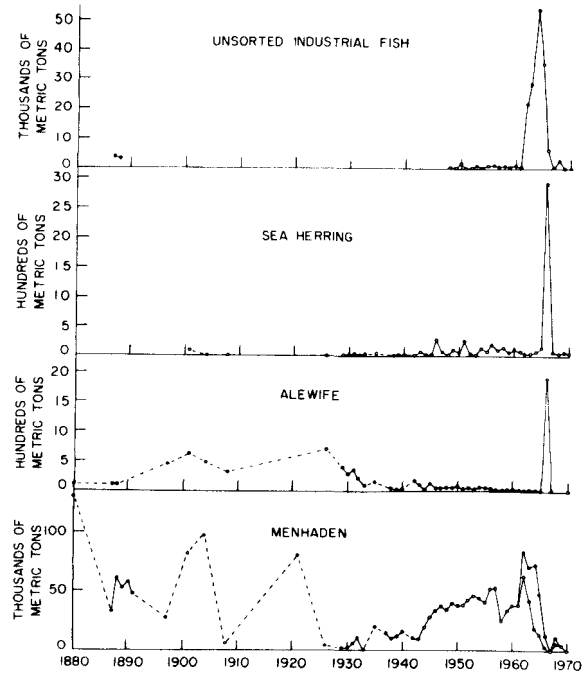

FIGURE 3.—Annual landings of industrial fishes in the State of New York, 1880-1970. The lines joining the black circles at the right of the menhaden graph represent total landings of all industrial species.

it is virtually certain that overfishing was the primary cause of the decline of both fisheries, the tendency of both resources to fluctuate widely in abundance from natural causes was an important contributing factor, which made overfishing inevitable.

The decline of the menhaden fishery north of Chesapeake Bay has been much sharper than to the southward. In New York the fishery is almost defunct (Figure 3). This decline could have been predicted with some assurance from the similarity of life histories of Atlantic menhaden and Pacific sardine and from the similar early collapse of the Pacific sardine fisheries in the north.

To state the background briefly, although both species spawn sometimes in waters near the northern parts of their ranges, the principal spawning areas are to the south, off southern California and Baja California, and to the south of Chesapeake Bay. Each year the fish make a

northward migration in spring and return in fall, and as they grow older they move farther north. Menhaden caught north of Chesapeake Bay usually are large, mature fish, most of which have had an opportunity to spawn at least once. It is probable that if menhaden fisheries had not developed south of Delaware Bay, the northern fisheries could have continued forever. It is certain that the abrupt decline in New York waters would have been slowed, if not prevented altogether. The resource would, of course, continue to fluctuate widely in abundance from natural causes, but the danger of overfishing probably would have been much less. The intense menhaden fishery in Chesapeake Bay, which now takes almost exclusively immature fish in their first and second years of life, reduces the life expectancy so greatly that few fish live long enough to migrate farther north. Thus, the collapse of the menhaden fishery in New York waters, like the early collapse of the sardine fishery in northern California and higher latitudes, was caused not so much by local overfishing, but by overfishing by other fleets in the waters of other States to the southward.

Menhaden landings in New York first began to decline in 1958. In 1959 a sharp increase in catches of menhaden in local pound nets heralded a brief increase in abundance, caused by unusually successful spawnings to the south. By 1962 menhaden landings in the State had risen to the highest level in recorded history since 1921. But the drop in 1958 had stimulated development of a new industrial fishery on mixed fish caught in otter trawls (Figure 3). This fishery for a while maintained the supply of industrial fish despite the rapid decline in menhaden landings after 1962, but the last year of substantial trawl catches of industrial fish was 1965. The decline of this trawl fishery had two principal causes, reduced abundance of fish on the grounds frequented by the fleet which was landing its catch in New York and return of most of the vessels to their home base in Rhode Island when the reduction plant at Point Judith opened (Smith, 1967).

In 1966, in a last desperate attempt to find alternate resources, the purse seine fleet made substantial catches of alewives (*Alosa pseudoharengus*) and Atlantic herring (*Clupea harengus*). The total catch of these two species (Figure 3) rose to more than 10 million pounds (4,600 metric tons), several times greater than any other year in recorded history. But this was a relatively small supply of fish for the menhaden plants, and the fishery lasted for only 1 year. The industrial fishing and processing industry of New York State has been virtually non-existent since 1966. The remaining plant on Long Island has closed, and the relatively few menhaden now caught in New York waters are taken to New Jersey for processing.

FOOD FISHERIES

As already mentioned, the history of the food fish and shellfish industry of New York State can be divided into three periods. Table 1 shows the relative and the absolute importance of the major species in four periods. It is clear even from this condensed summary that the species composition of the catch and the relative importance of many of the species have changed in complicated ways. It requires detailed consideration of each of the important species to understand how complex these changes have been and what implications are contained in this history.

Four sets of statistics were used in compiling these summaries. The illustrations are based on the Statistical Digests published annually by the Federal Government. The latest available, when background material for this paper was gathered, was Lyles (1969), which contained data for 1967. Since the 1950's the State of New York and the Federal Government have jointly published New York landings. The latest available was Smith (1971), containing data for 1970. Data on total commercial catches in the general area, including foreign catches, were taken from annual statistical bulletins compiled by the International Commission for the Northwest Atlantic Fisheries (ICNAF). The latest available was for 1968 (International Commission for the Northwest Atlantic Fisheries, 1970). The latest compilation of marine sport fish catches available was for 1965 (Deuel and Clark, 1968). Some data now are available on the 1970 marine sport fishing survey, but these could not be obtained in time for inclusion here.

TABLE 1.—Average annual landings in metric tons of major species of fish and shellfish in the State of New York for four major periods in the history of the commercial fishery of the State. Ranks by weight in parentheses.

Species	1887-1926	1929-1935	1938-1951	1952-1970
Oyster	6,085(1)	3,180(1)	3,270(2)	500(8)
Bluefish	2,360(2)	410(11)	* (25)	270(13)
Weakfish	1,315(3)	454(10)	590(13)	* (26)
Flounders	1,180(4)	2,950(2)	4,405(1)	2,860(2)
Cod	1,090(5)	1,180(4)	1,405(6)	454(9)
Shad	865(6)	135(21)	680(12)	180(17)
Hard clam	770(7)	545(9)	2,495(4)	2,250(3)
Alewife	410(8)	225(15)	* (30)	135(19)
Butterfish	365(9)	680(7)	1,225(7)	770(7)
American eel	365(10)	180(18)	90(24)	90(21)
Haddock		2,045(3)	2,770(3)	* (27)
Sea scallop		910(5)	1,045(10)	1,045(5)
Tilefish		865(6)	180(18)	* (24)
Scup		590(8)	2,360(5)	4,040(1)
Squid		365(12)	365(16)	410(10)
Atlantic mackerel		270(13)	680(11)	90(20)
Silver hake		270(14)	1,180(8)	1,135(4)
Soft clam		225(16)	135(22)	* (22)
Northern lobster		225(17)	90(23)	270(12)
Sea bass		180(19)	450(14)	270(14)
Surf clam		135(20)	1,135(9)	910(6)
Pollock		135(22)	* (28)	* (32)
Blue crab		90(23)	* (34)	* (30)
Atlantic bonito		90(24)	* (29)	* (29)
Sea mussels		* (28)	180(20)	* (25)
Red hake		* (29)	180(17)	180(16)
Striped bass		* (33)	180(19)	365(11)
Atlantic herring		* (37)	90(24)	225(15)
Northern puffer		* (58)	410(15)	180(18)
Flounders:				
Yellowtail			1,890	1,090
Winter			1,315	725
Summer			1,180	1,090

* Denotes average annual landings of less than 50 metric tons.

Domestic commercial fishery statistics are listed by States, but those of ICNAF and recreational fisheries are not. ICNAF added a new statistical area in 1966, which includes approximately the coastal and continental shelf waters from Rhode Island to Cape Hatteras, commonly referred to as the Middle Atlantic Bight. Prior to that time ICNAF statistics included only catches from Georges Bank north. Deuel and Clark (1968) reported sport fish landings by broad areas of coastal waters. Sport catches from waters off New York were included in the New England region.

For these reasons it was not possible to make direct comparisons of domestic commercial, foreign, and recreational catches for any single year. This is why the text follows the rather artificial device of comparing domestic commercial catches for 1970 with foreign catches for 1968 and recreational catches for 1965. This also is why, in comparing commercial and recreational landings, it was necessary to use the catch for the entire Atlantic coast north of Cape Hatteras.

OYSTER

Infrequent records of oyster production prior to 1929 show that landings probably were at a maximum in New York late in the 19th century and in the first decade of the 20th (Figure 4). Annual landings from 1887 to 1908 inclusive ranged from about 13 to 20 million pounds of meats (6,000 to 9,000 metric tons) and averaged over 15 million (7,000 metric tons). Thereafter, oyster production declined rather steadily

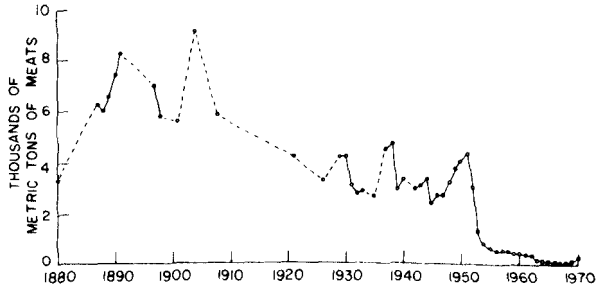

FIGURE 4.—Annual landings of oyster in the State of New York, 1880-1970.

except between 1926 and 1952 inclusive, when the trend was not obvious. Annual production in this period fluctuated between about 5 and 10 million pounds of meats (2,300 and 4,500 metric tons), and the average was somewhat more than 7 million pounds (3,200 metric tons). Although average landings in this intermediate period were only about half those reported at the turn of the century, this was in many ways the heyday of oystering in New York, despite closing of some once important grounds by pollution. Especially in Long Island Sound, this was the most highly mechanized and advanced form of oyster farming on the Atlantic and Gulf of Mexico coasts. After 1952 oyster landings in New York dropped sharply, and since 1959 annual production has been less than a million pounds of meats (less

than 450 metric tons). The low point was reached in 1967 with total production of only about 100,000 pounds of meats (45 metric tons).

The principal cause of the collapse of the New York oyster industry was a massive invasion of sea star (*Asterias forbesi*) in the 1950s. Favorable environmental conditions for this predator led to an extremely high survival of young sea stars, and the industry was unable to cope with this added predation, even with the relatively successful control measures that it had developed previously. Recovery has been slow because many other natural and man-made problems exist, including oyster drills (*Urosalpinx cinerea*, and to a lesser extent *Eupleura caudata*), unpredictable effects of storms, and a highly variable and reduced supply of young oysters. Wallace (1971) has cited water pollution as one of the major problems of the oyster industry in New York, but he voiced great hopes for hatcheries, four of which now are producing seed in New York. By 1970 oyster production in the State had increased fivefold, but still only to about half a million pounds of meats (230 metric tons). Time will tell whether hatcheries are the answer to the problems of the industry. The idea certainly is not new. The first oyster hatchery in New York was in operation in 1921 (New York Conservation Department, 1969). MacKenzie (1970) has suggested that natural setting is adequate to supply the needs of the industry for seed, if adequate measures are taken to eliminate mortality from siltation, predators, and careless handling. The feasibility of these methods of rehabilitating the oyster industry, no matter how valid they may be biologically, needs to be tested by economic studies.

SOFT CLAM

Traditionally a popular seafood in New England and the middle Atlantic region, the soft clam (*Mya arenaria*) has produced steadily decreasing landings in New York (Figure 5). Production in 1880 was reported as more than 3 million pounds of meats (1,370 metric tons). Average annual landings for years on record from 1887 to 1908 inclusive were just under 1 million pounds

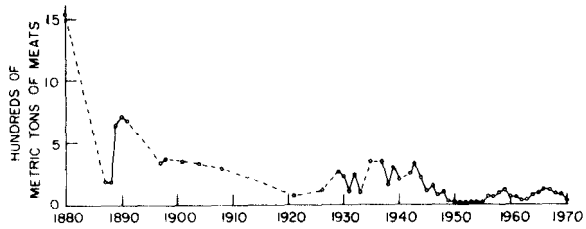

FIGURE 5.—Annual commercial landings of soft clam in the State of New York, 1880-1970.

(450 metric tons), from 1921 to 1945 inclusive less than half a million (200 metric tons), and from 1946 to 1970 less than 200,000 pounds (90 metric tons). To some extent the decline may have been caused by the long-term rise in water temperatures which in New England led to increased predation by green crabs. Wallace (1971) has attributed the decline in production to "pollution and physical changes in the estuaries." The soft clam is a vulnerable, shallow water species, and there is little doubt that overharvesting and lack of adequate regulation of the fishery were important factors.

BLUE CRAB

In the waters of New York State the blue crab, *Callinectes sapidus*, is near the northern limit of its range. It has never been a major species in the catch in this area. Because the blue crab is highly variable in abundance from natural causes even in the center of its range (McHugh, 1969a), it might be expected to be extremely variable in New York waters, and the history of the commercial fishery suggests that this has been true (Figure 6). Landings have declined steadily, but irregularly, since the maximum recorded catch of about 1.6 million pounds (725 metric tons) in 1880. Catches rose briefly in the 1930s, to a recorded peak of more than half a million pounds (270 metric tons) in 1935, but after a minor upsurdge in the early 1950s the fishery collapsed. No commercial catch has been recorded since 1961.

In Chesapeake Bay, with major fluctuations, the blue crab catch has been increasing for about 35 years. It has been suggested that the increased catch has been caused by increased

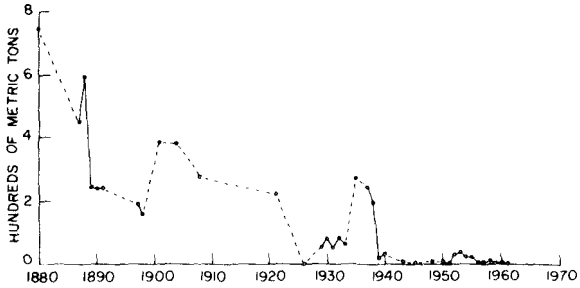

FIGURE 6.—Annual commercial landings of blue crab in the State of New York, 1880-1970.

abundance generated by nutrient enrichment in the estuaries (McHugh, 1969a), as was suggested also for striped bass (Mansueti, 1961). There is no direct evidence to support this hypothesis, but it is not untenable. Other than the decade of increased landings of blue crab which began about 1929 in New York, and a longer period of highly variable but substantially increased catches in the middle Atlantic region which ended in the late 1950s (McHugh, 1971),[3] there has been no similar continuing upward trend in blue crab production north of Chesapeake Bay. It is interesting to speculate that the enrichment of coastal waters and estuaries in the middle Atlantic region of the United States from domestic and industrial wastes may have stimulated blue crab production for a while, then became a limiting factor as eutrophication proceeded too far.

SHAD

The anadromous American shad (*Alosa sapidissima*), like the salmon, was a popular fish with the early settlers, wherever it was found along the Atlantic coast. Large catches have been reported in the early days from all major river systems. The Hudson River was one of the major producers, and maximum landings on record in New York State were more than 4 million pounds (2,000 metric tons) in 1889 (Figure 7). From 1880 to 1901 inclusive the average annual catch was over 3 million pounds (1,400 metric tons); from 1904 to 1935 inclusive it was only about one-tenth of this; then the catch began a steady rise to a peak of almost 3 million pounds (1,300 metric tons) in 1945, followed by an abrupt decline to less than a million pounds (275 metric tons) in 1949. Shad landings in New York for the last 3 years have been very much less than 100,000 pounds (about 16.5 metric tons).

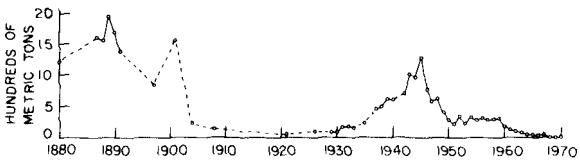

FIGURE 7.—Annual commercial landings of shad in the State of New York, 1880-1970.

This continued decline to what amounts to virtual collapse of the fishery is disturbing, especially in the light of the following statement by the Biological Section of the Scientific Committee of the Atlantic States Marine Fisheries Commission (1958a): "The Hudson River investigation has been completed and the fishery can now be managed successfully." What has gone wrong in little more than a decade?

The report cited above, and another special publication of the Atlantic States Marine Fisheries Commission (1958b) completely ignored the sharp increase in shad landings in New York, and indeed in the entire middle Atlantic region including Chesapeake Bay. At the time these reports were prepared the shad fishery of this entire region had swung from a maximum catch of nearly 36 million pounds (16,250 metric tons) in 1897 to a low of 5 million (2,270 metric tons) in 1935, to a secondary peak of about 12 million pounds (5,500 metric tons) in 1944 and again in 1945, and down again to less than 6 million pounds (2,700 metric tons) in 1958. It is difficult to reconcile the pompous statement quoted above with the past and subsequent history of the fishery (Figure 7). It is especially embarrassing to this author, who was chairman of the committee that issued these two reports.

[3] McHugh, J. L. 1971. Domestic wrangles and international tangles—the fisheries of the Middle Atlantic Bight. Unpublished manuscript, 237 p., filed at Woodrow Wilson International Center for Scholars, Washington, D.C.

The phenomenon of the rise and fall of the shad fishery in the Hudson River from 1924 to 1953 has been analyzed in some detail by Burdick (1954). He concluded that overfishing from 1941 to 1951 was responsible for the decline, which first became noticeable in 1946. He found no evidence that water pollution had any different effect on the shad stocks of the river during the period of rising catches than during the period after 1945. The overfishing was caused, according to Burdick, by the increased demand for fishery products during the war which led to relaxation of the fishing regulations (substantial shortening of the weekly closed season).

BLUEFISH

The bluefish (*Pomatomus saltatrix*) is a mysterious oceanic visitor to the coastal waters of New York. Commercial landings at the turn of the century (Figure 8) were 10 million pounds or more (average of about 4,800 metric tons for the 3 years 1897, 1901, and 1904). Early in the 20th century commercial landings dropped

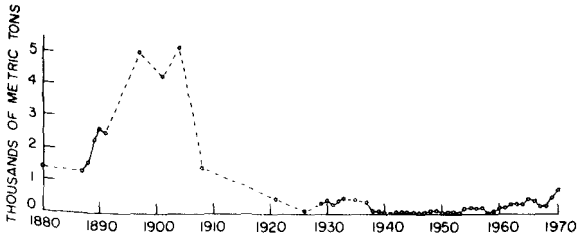

FIGURE 8.—Annual commercial landings of bluefish in the State of New York, 1880-1970.

abruptly, then rose from much less than a million pounds (135 metric tons) in the 1920s to about a million pounds (450 metric tons) in the 1930s, dropped to a very low level in 1940, and have been increasing, with some fluctuation, to nearly 2 million pounds (725 metric tons) in 1970.

Bluefish are an important and much sought after sport fish in the middle Atlantic region. Recreational catches for New York waters alone are not available in published analyses of data gathered by the Census Bureau (Deuel and Clark, 1968), but for the Atlantic coast as a whole the sport catch in 1965 was reported to be over 90 million pounds (41,000 metric tons), almost 15 times the total commercial catch of bluefish. Thus, it is probable that recreational fishermen take much more bluefish than commercial fishermen from New York waters. Briggs (1962, 1965, 1968) has confirmed that bluefish are among the most important species in the sport fisheries of Long Island.

Bluefish migrate to New York coastal waters in summer. Abundance is notably variable, but it is not understood clearly whether this is caused by real variations in abundance, or by a response to changing oceanographic conditions, or both. Abundance appears to have been increasing for the past 10 years or more.

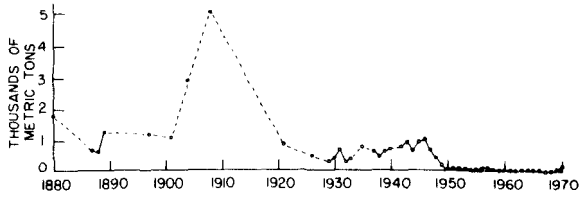

FIGURE 9.—Annual commercial landings of weakfish in the State of New York, 1880-1970.

WEAKFISH

The weakfish or gray seatrout (*Cynoscion regalis*) has been an important commercial species along the Atlantic coast. At the turn of the century most of the catch came from New York and New Jersey waters. Later the center of the fishery shifted southward to the area from Delaware Bay to the North Carolina sounds. The greatest landings recorded in New York were in 1908 (Figure 9) at over 11 million pounds (5,100 metric tons). Landings dropped to less than 1 million pounds (400 metric tons) in 1929, rose slowly to over 2 million (1,000 metric tons) in 1946, then dropped to very low levels after about 1948. The abundance of the species has declined along the entire Atlantic coast if commercial catches are a valid criterion. Recently, however, it apparently has been more abundant in the coastal waters of New York, especially in sport

fish catches. According to Perlmutter, Miller, and Poole (1956) weakfish available to New York fishermen belong to two distinct stocks, those which spawn locally and those which are southern spawned. These authors said that weakfish are abundant off New York only when the southern stock is large.

The recreational catch of weakfish in 1965 was estimated to be only 178,000 pounds (81 metric tons). It probably was considerably greater than this in 1970, but it appears that this is primarily a commercial species still.

The reason for the great decline in catches of weakfish is not known. Off Virginia in 1936 it was about 10 times as abundant as it was in 1946, according to the catch rate in pound nets (McHugh and Bailey, 1957). The increased catches in New York in the 1940s probably were caused by the increased demand for fish during the war, as already mentioned for several other species. Weakfish have been taken by trawlers in relatively deep water in winter, but the species has not been recorded in foreign catches off the Atlantic coast. Large numbers of young fish are killed by shrimp trawls in the Carolinas and in pound nets in Chesapeake Bay. Some people believe that this attrition has been responsible for the decline, but this source of mortality must have declined with the decline of the Atlantic coast pound net and shrimp fisheries.

SEA MUSSEL

Mussels are not in great demand as human food in the United States. Landings in New York State have been relatively small, seldom exceeding 1 million pounds of meats (500 metric tons). In 1908, however, a catch of over 8 million pounds of meats (3,800 metric tons) was reported, and in the 1940s (Figure 10) landings increased for a few years, probably because mussels were valued as a source of Vitamin D during the second world war. This may be a valuable latent resource if markets can be developed. The possibilities for aquaculture also should be investigated. Very high yields have been reported with hanging culture of mussels in Europe.

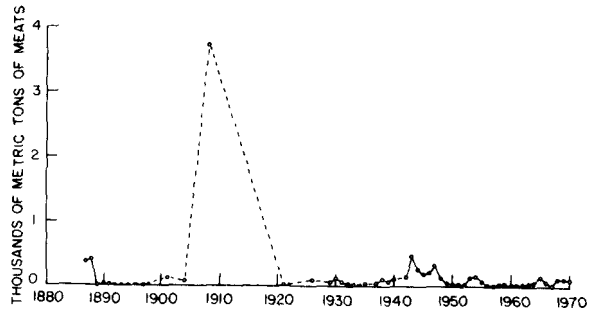

FIGURE 10.—Annual commercial landings of sea mussels in the State of New York, 1887-1970.

BAY SCALLOP

Bay scallop are in great demand and bring a high price. Landings in New York sometimes exceeded 1 million pounds of meats (520 metric tons in 1921) prior to 1932 (Figure 11), but the catch dropped sharply thereafter. The decline has been attributed to destruction of eelgrass

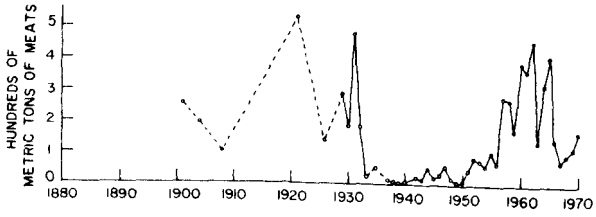

FIGURE 11.—Annual commercial landings of bay scallop in the State of New York, 1901-1970.

(*Zostera*) beds, by disease (*Labyrinthula*). As the eelgrass recovered, bay scallop became more abundant; and by 1962, landings in New York were up almost to a million pounds again. The abrupt decline to a low in 1967 may have been caused by overfishing.

HADDOCK

Haddock landings in New York apparently were at their greatest from 1908 to 1929 (Figure 12). The largest landing on record was in 1926 at about 17 million pounds (7,700 metric

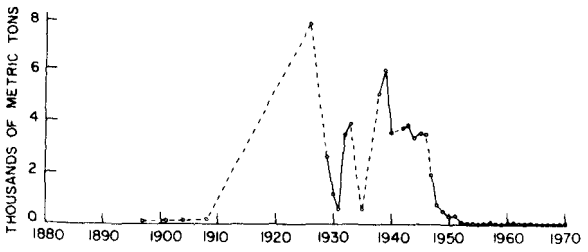

FIGURE 12.—Annual commercial landings of haddock in the State of New York, 1897-1970.

tons). Following a substantial drop in the 1930s the catch reached a secondary maximum in 1939, dropped to an average annual catch of about 8 million pounds (3,600 metric tons), to 1946 inclusive, then declined sharply, and remained extremely low for the last two decades. This decline of local haddock landings probably came about through the general decline of the New York trawl fleet after the war, for landings in New England, mostly from Georges Bank, remained remarkably steady from the late 1930s to the middle 1960s (Graham, 1968). Recent overfishing has brought the Georges Bank haddock stock to a very low level (Edwards, 1968), and it is unlikely that haddock will again become an important component of New York landings for some time, if ever.

TILEFISH

No record of tilefish (*Lopholatilus chamaeleonticeps*) landings in New York is available prior to 1929 in statistics published by the Federal Government. Yet Bigelow and Schroeder (1953) stated that 11,641,500 pounds (5,285 metric tons) of this species were caught off New England from July 1, 1916, to July 1, 1917. These authors concluded that the drop to less than half a million pounds (220 metric tons) in 1947 (about 42% of it in New York) was caused by a lack of demand.

The tilefish is of special interest to ecologists, although now a minor commercial species, because it inhabits a narrow band of ocean bottom at the edge of the continental shelf from Nova Scotia to southern Florida and in the Gulf of Mexico. Off New England and the middle Atlantic coast it is restricted to a zone of relatively warm water of about 8° to 12°C at depths of 82 to 360 m. Within 3 years after its existence was discovered in 1879 almost due east of New York Bight, the tilefish resource suffered a mass mortality. Large numbers of dead tilefish were reported floating at the surface over the edge of the continental shelf from off Delaware Bay to New England. The kill was attributed by Bigelow and Schroeder (1953) to a sudden shift or dissolution of this warm intrusion. The reduction in abundance was so drastic that no tilefish was taken in the area until 1892, and substantial commercial fishing on the resource did not resume until 1898. It is thus established that the tilefish is subject to very wide fluctuations in abundance from natural causes.

When tilefish first appeared in the commercial fishery statistics for New York State in 1929, landings were about 2.5 million pounds (1,180 metric tons). The catch fluctuated between 1 million (454 metric tons) and 2.5 million pounds in the period 1929 to 1935, then dropped sharply to nearly zero in the middle 1940s (Figure 13).

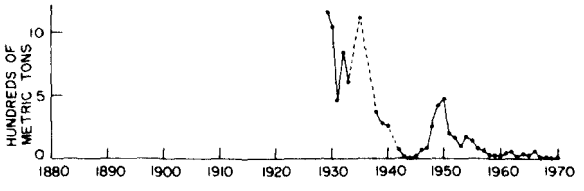

FIGURE 13.—Annual commercial landings of tilefish in the State of New York, 1929-1970.

A secondary maximum of just over a million pounds was reached in 1950, and subsequently landings in New York dropped steadily to a very low level. The collapse of this fishery in New York may have been caused by lack of demand, by the general decline of the trawl fisheries of the State after the war, by a natural decline in abundance, or by overfishing. Tilefish are not listed separately in the statistical bulletins of ICNAF, but are included under "other groundfish." In 1968 this category included a catch of 172,000 metric tons of mixed fish, which

could have included significant quantities of tilefish. A deep-sea sport fishery has developed recently (Richard H. Schaefer, personal communication).

COD

Cod, like many of the species caught principally or exclusively in otter trawls, was landed in maximum quantities in New York 30 to 35 years ago (Figure 14). The peak catch was about 8.5 million pounds (3,870 metric tons) in 1938, and landings declined sharply thereafter, as the trawl fishery of the State declined. The trend of New York landings of cod prior to 1940 was different from the trend of total U.S. catches of the species, which have declined irregularly since the last decade of the 19th century from 60,000 metric tons to less than 12,000 metric tons in 1953 (Graham, 1970). After 1940, cod landings in New York dropped at a fairly steady rate, from about 3 million pounds (1,450 metric tons) to less than half a million (200 metric tons) in 1970.

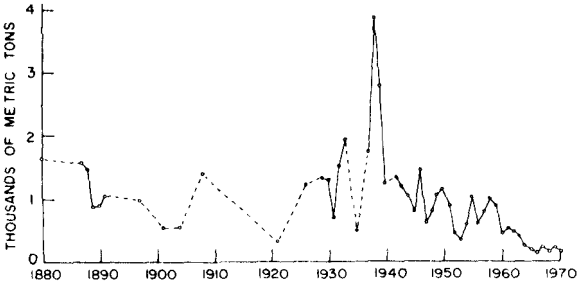

FIGURE 14.—Annual commercial landings of cod in the State of New York, 1880-1970.

The cod resource of the North Atlantic Ocean is tremendous, as demonstrated by the dominance of this species in landings from the ICNAF regulatory area. In 1968, for example, the catch of cod in this area was 1.86 million metric tons, about 48% of the total catch of all species from the area, which included at least 120 species of fish, shellfish, and other marine organisms of commercial value. Neither Graham (1968) nor Edwards (1968) considered that the cod stocks in the areas fished by Americans were overexploited. Edwards (1968) estimated that the standing crop in those areas was about 489 million pounds (222,000 metric tons), of which about 32% was being caught annually. Nevertheless, according to ICNAF annual reports pressure on the cod stocks is heavy, and there is some evidence that yields could be increased by increasing the mesh size of the trawls.

Cod is not the principal species sought by the U.S. fishing fleet but is taken incidental to the haddock fishery. A substantial sport fishery for cod has developed along the north and middle Atlantic coasts of the United States. The recreational catch in 1965 was estimated to be nearly 30 million pounds (13,580 metric tons).

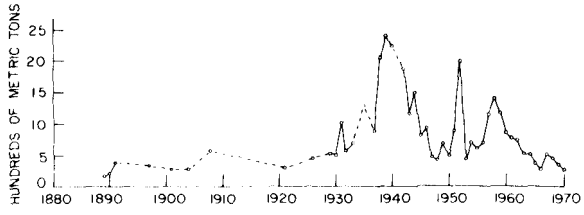

FIGURE 15.—Annual commercial landings of butterfish in the State of New York, 1889-1970.

BUTTERFISH

The trend in landings of butterfish in New York (Figure 15) is not unlike the pattern for cod (Figure 14) and other trawl-caught species. The maximum catch was more than 5 million pounds (2,380 metric tons) in 1939. Thereafter, the catch declined irregularly to a low of about half a million pounds (240 metric tons) in 1970. The pronounced variations in catch were probably caused mainly by variations in success of spawning. The downward trend reflects the decline of the trawl fishery. Small panfishes like butterfish, which cannot be filleted and made into fish sticks or portions at reasonable cost, have declined in popularity as the frozen fish industry has developed. Reduced demand for such kinds of fish almost certainly has contributed to the decline of the New York trawl fisheries.

Relatively large quantities of butterfish are taken by foreign fishing fleets in international waters. In 1968 the total reported catch in the ICNAF statistical area was about 4,000 metric tons, somewhat less than half of which was caught by American fishermen. New York's share was only about 10% of the domestic catch.

Edwards (1968) estimated that the standing crop of butterfish off New England and New York was about 309 million pounds (140,300 metric tons) of which only about 3% is taken each year by the commercial fisheries. He considered that the resource is underutilized, mainly because it is a midwater species for which no effective fishing gear has yet been developed.

Schaefer (1967), sampling with a beach seine in the surf along the south shore of Long Island, found that butterfish were the most abundant species in his catches in 1961. In 1962 and 1963 they dropped to third and sixth place respectively, which may mean that this species varies widely in abundance from natural causes.

There is no recorded sport catch of butterfish, although it is known that they will bite on small baited hooks.

SILVER HAKE

Silver hake, often called whiting, is the most abundant groundfish on New England banks according to Edwards (1968). Demand for silver hake as a food fish is limited in the United States. Much of the domestic catch is used for animal food, and some as industrial fish. Edwards (1968) estimated that the standing crop on American fishing grounds in the middle 1960s was about 2.1 billion pounds (nearly a million metric tons) and that the average annual catch by all commercial fishing fleets was about 31% of the standing crop. Peak landings in New York were about 6 million pounds (2,690 metric tons) in 1943 (Figure 16). The catch declined to an average of less than a million pounds (420 metric tons) from 1948 to 1952, then rose and maintained an average annual level of about 2.8 million pounds (1,270 metric tons) for 16 years, from 1954 to 1969 inclusive. In 1962 foreign catches began to rise rapidly from previously

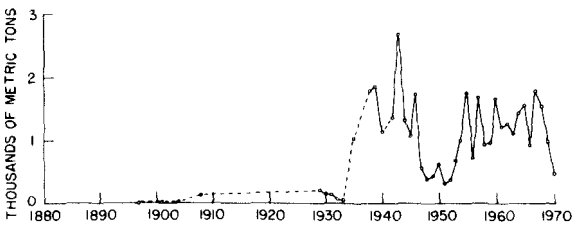

FIGURE 16.—Annual commercial landings of silver hake in the State of New York, 1897-1970.

low levels. The total catch in the ICNAF area reached 373,000 metric tons in 1965, then dropped just as abruptly, but New York landings were not affected very much, nor were U.S. landings as a whole. Strong year classes apparently were produced in 1967 and 1968, which augurs well for the fishery in 1970 to 1972 (International Commission for the Northwest Atlantic Fisheries, 1969). The recent decline in New York landings can be attributed only to the decline of the local trawl fleet.

The sport catch of silver hake in the New England and middle Atlantic areas in 1965 was estimated to be about 6 million pounds (2,720 metric tons).

NORTHERN PUFFER

The northern puffer, or swellfish, although it is abundant from Cape Cod southward, was not considered to be an important food fish until meat rationing during the second world war stimulated the coastal fisheries. The greatest catch in New York waters was in 1945, when almost 2.5 million pounds (1,060 metric tons) were landed. Subsequently the catch declined to less than 200,000 pounds or about 70 metric tons (Figure 17), rose to a secondary maximum in 1963 (nearly a million pounds or 430 metric

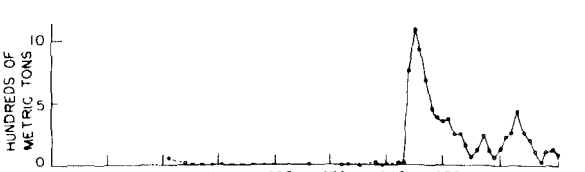

FIGURE 17.—Annual commercial landings of northern puffer in the State of New York, 1901-1970.

tons), and dropped off again. Until recently most of the catch has come from Gardiners and Peconic Bays; but as landings dropped in the middle 1960s, fishing effort shifted to the ocean off the south shore of Long Island and to a lesser extent into Long Island Sound.

Richard Miller, Executive Secretary of the Long Island Fishermen's Association (personal communication), says that the decline in New York landings of northern puffer was caused by the growing fishery in Chesapeake Bay (McHugh, 1969a), which led to a substantial decline in prices.

The declining catch of northern puffer in the bays of the eastern end of Long Island may have been caused by the decline of the pound net fishery, by overfishing, or by natural causes. The drop has been substantial, from a maximum of over 850,000 pounds (385 metric tons) in 1963 (over 90% of total commercial landings of puffers in New York) to 90,000 pounds (41 metric tons) in 1969 (less than 35% of total New York puffer landings). Recent development of fisheries for this species in the ocean and in Long Island Sound suggest that it may be generally an underexploited resource in the waters of the State.

The northern puffer is one of the more important species in the coastal sport fisheries of New York, although this is more by accident than by design. According to Briggs (1965) they are regarded as a nuisance, especially by flounder fishermen, who complain that puffers "steal their bait." Indeed, when puffers are abundant in Great South Bay, spring catches of winter flounders go down, not necessarily because they are less abundant but because puffers take the bait more readily and this discourages flounder fishermen. In the bays of eastern Long Island the catch of puffers by sport fishermen apparently has not had a great effect on the commercial fishery, for Briggs (1968) found that this was not a particularly important element of sport catches there.

The increase in commercial landings of puffers from 1960 to 1963 (Figure 17) probably was caused by a real increase in abundance. This is confirmed by two sport fishing studies. Briggs (1965) estimated that the sport catch of puffers in Great South Bay increased about fivefold from 1960 to 1962, from about 58,000 to about 314,000 fish. The sport catch was almost as high in 1963 as in 1962. Schaefer (1967) estimated the relative abundance of fishes in the surf zone on the south shore of Long Island and found that puffers were the most abundant species in catches of a beach seine in 1962 and 1963 (about two-thirds of all the fish caught), whereas in 1961 less than 1% of the catch had been puffers.

In 1965 it was estimated that about 26 million pounds (11,750 metric tons) of northern puffers were taken by sport fishermen along the middle Atlantic coast.

ATLANTIC MACKEREL

Once an important fishery, the domestic Atlantic mackerel industry has been producing for the last 15 years or more only about 3% of the maximum recorded catch in 1884 (Hoy and Clark, 1967). Landings of mackerel in New York have fluctuated more or less in proportion to domestic landings along the Atlantic coast as a whole. Most of the catch in New York now is made in pound nets, although gill nets at one time were the most important gear. Thus, to some extent the decline in New York landings (Figure 18) may have been caused by the decline of the pound net fishery. The demand for mackerel in the United States also is less than it was early in the century. Abundance varies widely from natural causes (Sette, 1938).

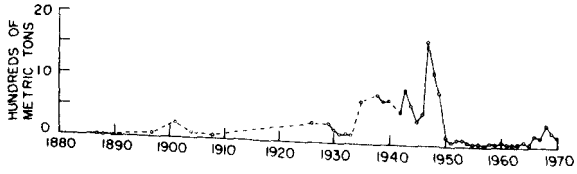

FIGURE 18.—Annual commercial landings of Atlantic mackerel in the State of New York, 1887-1970.

Mackerel are important in high-seas fisheries by foreign fleets. In 1968 the total catch reported from ICNAF statistical areas was 71,595 metric tons, of which only 3,001 metric tons were caught by American commercial fishermen. Thus, the present total catch by all nations is almost equal to the greatest domestic catch on

record. The estimated recreational catch in 1965 was nearly 19 million pounds (8,590 metric tons). It appears that the decline of the domestic mackerel fishery was a matter of declining demand and that sport fishermen and foreign fleets have willingly preempted the harvest.

Edwards (1968) noted that mackerel have not been abundant in the northwestern Atlantic recently, but that abundance has been increasing.

SEA BASS

Landings of sea bass in New York fluctuated around a level of about half a million pounds (225 metric tons) a year until 1943 (Figure 19), when the catch began to rise sharply, reaching a maximum of about 2.8 million pounds (1,270 metric tons) in 1951. Then the annual landings began to drop just as sharply, and they are still falling. Commercial landings in New York in 1970 were only about 70,000 pounds (32 metric tons). This is primarily a fish of shallow waters,

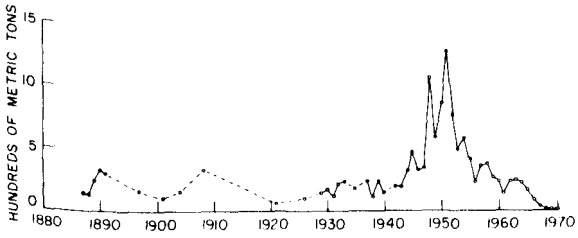

FIGURE 19.—Annual commercial landings of sea bass in the State of New York, 1887-1970.

and no landings have been reported by foreign fleets in the ICNAF statistical areas. Sea bass move offshore to deeper water in winter, and some may be included in the unidentified category. Most of the domestic commercial landings in New York are caught in otter trawls, and a substantial part of this sea bass catch comes from outside the 3-mile limit, if not beyond the zone of domestic fishery jurisdiction.

For the Atlantic coast as a whole the recreational catch of sea bass in 1965 was estimated to be nearly 11 million pounds (4,945 metric tons), more than 2.5 times the total commercial catch on the Atlantic coast in 1970. Partial surveys of the sport fisheries of Long Island, cited elsewhere, do not show that this is a very important recreational resource in this area.

The decline in sea bass landings in New York is attributable at least partly to the decline of the trawl and pound net fisheries. Landings in New Jersey and the Chesapeake Bay States have declined also, but neither as abruptly nor as soon. It is not known whether the resource has been overfished, and it appears that to some extent the decline in commercial landings may have been offset by increased recreational catches.

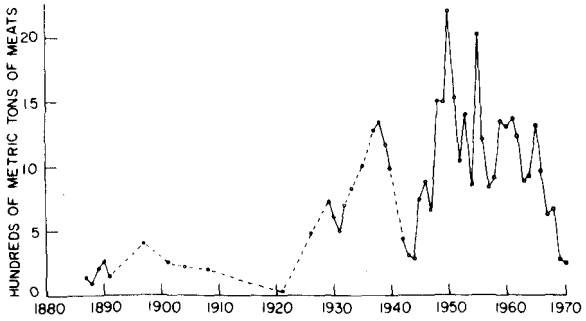

FIGURE 20.—Annual commercial landings of sea scallop in the State of New York, 1887-1970.

SEA SCALLOP

The history of sea scallop landings in New York has been generally similar to the history of landings of the same species in New England (Graham, 1968). The recent sharp decline in New York landings (Figure 20) has the same causes as the similar decline of the U.S. sea scallop catch as a whole: increased catches by foreign fishermen, and generally poor survival after the last highly successful spawning which reinforced the scallop population on Georges Bank early in the 1960s. Sea scallop landings at Fulton Fish Market declined abruptly after 1965, and by 1970 the number of trips by scallop dredgers landing their catch there had dropped considerably.

SCUP

As illustrated by Figure 21, scup became increasingly important in New York landings in the 1940s and 1950s, reaching a maximum of

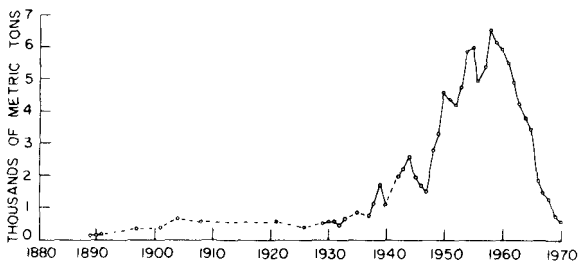

FIGURE 21.—Annual commercial landings of scup in the State of New York, 1889-1970.

over 14 million pounds (6,490 metric tons) in 1958. In fact, scup ranked first by weight of all food fishes and shellfish landed in New York from 1953 to 1961 inclusive. The subsequent decline was abrupt, the catch dropping to just over a million pounds (545 metric tons) in 1970. Almost all of the catch was made by otter trawls, most of it beyond the 3-mile limit, and about half of it landed at Fulton Market in New York City. The causes of declining commercial catches are not understood at all clearly. The total domestic catch in 1970 was only about 10.5 million pounds (4,770 metric tons), less than what was landed in New York alone in 1958. The foreign catch in 1968 was only about 5 million pounds (2,255 metric tons). The total recreational catch in 1965 was estimated to be about 37.6 million pounds (17,075 metric tons).

Briggs (1968) found that scup were the most important species by numbers caught in the sport fisheries in the bays of eastern Long Island. In 1965, for example, he estimated that the total catch in this small area was over a million fish, 44% of the catch by numbers. The following year the sport catch in the same area was reduced by nearly 50%. Finkelstein (1969) noted that from historical times scup were known to go through extreme variations in abundance, from great abundance to such scarcity that the species was virtually absent for years.

Edwards (1968) estimated that the standing crop of scup from New York Bight north was about 66 million pounds (30,000 metric tons) per year from 1963 to 1965. Average annual commercial landings in the same period were about 10 million pounds (4,540 metric tons), and thus the commercial fisheries were taking only about 15% of the standing crop each year. It would appear from all these estimates and other data that if the decline in scup landings has been caused by fishing, the sport fisheries have been the principal contributing agent. However, it appears equally likely that variations in spawning success could be the cause. Of course, when the resource is at an extremely low level of abundance, whatever the cause, it may be much more vulnerable to heavy fishing intensity.

FLOUNDERS

The major species of flounder in the New York catch are yellowtail, winter flounder or blackback, and summer flounder or fluke. Other names which appear in United States or ICNAF statistics are gray sole (*Glyptocephalus cynoglossus*), which ICNAF calls witch; lemon sole, which is simply a winter flounder that weighs more than 3½ lb. (1.6 kg); dab (*Hippoglossoides platessoides*) which is called American plaice by ICNAF; and hogchoker (*Trinectes maculatus*). The last two, and perhaps some other species, may be included under unidentified categories in New York landings. This vernacular and scientific terminology is so confusing that these names have been listed and properly paired off in Table 2 as compared with the official listing of the American Fisheries Society (Bailey, 1970).

Individual species of flounder were not identi-

TABLE 2.—Common and scientific names of flounders as used in domestic (NMFS) and international (ICNAF) statistics, and as endorsed by the American Fisheries Society (AFS).

Common name	Source	Scientific name
Yellowtail flounder	NMFS, ICNAF, AFS	*Limanda ferruginea*
Blackback flounder	NMFS (under 3½ lb.)	
Lemon sole	NMFS (over 3½ lb.)	*Pseudopleuronectes americanus*
Winter flounder	ICNAF, AFS	
Fluke	NMFS	
Summer flounder	ICNAF, AFS	*Paralichthys dentatus*
Gray sole	NMFS	
Witch	ICNAF	*Glyptocephalus cynoglossus*
Witch flounder	AFS	
Dab	NMFS	
American plaice	ICNAF, AFS	*Hippoglossoides platessoides*
Hogchoker	NMFS, ICNAF, AFS	*Trinectes maculatus*

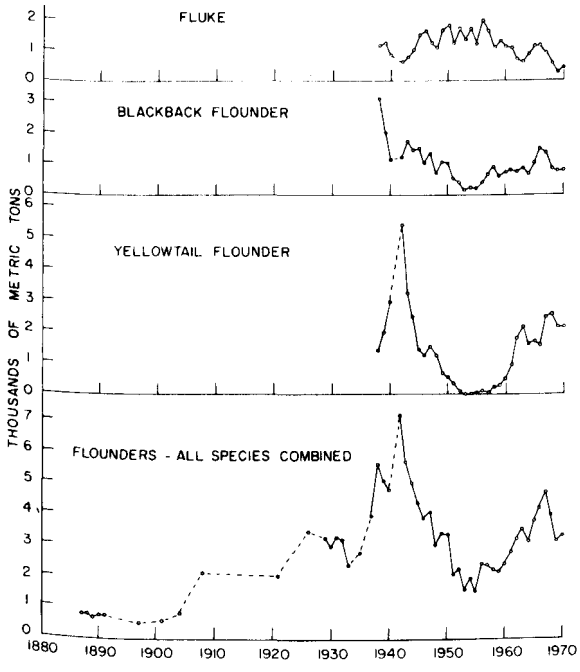

FIGURE 22.—Annual commercial landings of flounders in the State of New York, 1887-1970.

fied in U.S. statistics until about 1938 (Figure 22). Total landings of all flounder species in New York have two maxima, one at nearly 16 million pounds (7,130 metric tons) in 1942 and the other at more than 10 million (4,720 metric tons) in 1967. Between these peaks the catch dropped off to an average annual minimum level of about 4 million pounds (1,850 metric tons) from 1951 to 1955 inclusive.

Most of this dip, and much of the subsequent rise, was caused by a wide oscillation in landings of yellowtail flounder (Figure 22) from about 12 million pounds (5,400 metric tons) in 1942 to virtually nothing in 1952 to 1957, then back to nearly 6 million pounds (2,565 metric tons) in 1968. Graham (1968) attributed these fluctuations to changes in abundance of yellowtail flounder, without citing causes. Royce, Buller, and Premetz (1959) went into the question in detail. Edwards (1968) estimated that the standing crop of yellowtail flounder in areas fished by Americans was 185 million pounds (84,000 metric tons). Average total landings from these same areas from 1963 to 1965 were more than 50% of the standing crop annually, which is the highest fishing rate for any species in the area.

Smith (1963, 1968, 1969) also noted the increasing abundance of yellowtail flounder in the 1960s on grounds frequented by New York fishermen. Despite an abrupt drop in numbers of trawlers landing their catches at Fulton Fish Market in New York City from 1960 to 1966 (a drop of approximately 80%) the weight of yellowtail landed nearly doubled. From 1960 to 1965 and 1966 the catch of yellowtail per trip rose from about 71 lb. to about 700 lb., a crude but fairly convincing index of increasing abundance. Lux (1969) presented evidence that dominant year classes spawned in 1958, 1959, and 1960 produced greater abundance of yellowtail on fishing grounds off New England from 1960 to 1963, but that abundance declined from 1964 to 1966. Alarmed at the heavy rate of fishing on this resource, ICNAF established catch quotas in 1970 aggregating 29,000 metric tons, and in the following year reduced this quota to 26,000 tons.

The yellowtail flounder is a species of relatively deep water. No catches were reported by sport fishermen in 1965.

Winter flounder landings in New York also declined from the 1930s to the early 1950s, then rose again. The domestic commercial catch dropped from nearly 7 million pounds (3,050 metric tons) in 1938 to about a third of a million (160 metric tons) in 1953, then back to slightly over 3 million (1,475 metric tons) in 1966. According to Poole (1969) winter flounders have been abundant recently in New York waters. He attributed the relatively small commercial landings in the State to restrictions on trawling which have been in effect for 25 to 30 years. This is primarily a fish of shallow coastal waters. In 1968 in the western North Atlantic foreign fleets took only 1,200 metric tons, as compared with a total domestic commercial catch of about 10,700 metric tons.

The total U.S. sport catch of winter flounder in 1965 was nearly 29 million pounds (over 13,000 metric tons). The species is important in the saltwater sport fisheries of the State.

Briggs (1962, 1965, 1968) found that about 1.5 million fish were taken in Great South Bay each year and about another million per year in Moriches, Shinnecock, Gardiners, and Peconic Bays. In 1964 to 1966 he found that winter flounders made up from 17 to 40% of the sport catch by numbers in the bays of eastern Long Island.

Edwards (1968) estimated that the standing crop of winter flounder in the northwestern Atlantic was about 185 million pounds (84,000 metric tons), about the same as the estimate for yellowtail. The rate of exploitation by commercial fleets, however, was considerably less, about 17% per year.

Commercial landings of summer flounders in New York (Figure 22) have followed essentially the same trend as commercial catches for the New England and middle Atlantic States as a whole, reaching a maximum in the 1950s and dropping off fairly steadily thereafter. Poole (1966) suggested that the increase in catch from 1938 to the 1950s was a result of increased fishing effort, not increased abundance. Commercial landings in New York are only about 20% of total commercial landings, and there is no reported foreign catch. The total recreational catch in 1965 was estimated to be nearly 35 million pounds (15,800 metric tons), about 6 times the total commercial catch of 5.7 million pounds (2,590 metric tons).

The summer flounder, like the winter flounder, is one of the most important sport fishes in New York waters. Briggs (1962) found that from 1956 to 1960 sport fishermen took about 1.5 million fish per year from Great South Bay alone. The New York State Department of Environmental Conservation has estimated that 1.7 million anglers fish each year in marine waters of the State (A. C. Jensen, personal communication). Their removals of summer flounder and other species are a very important part of total fishing mortality.

SURF CLAM

The surf clam fishery of the Atlantic coast began its period of major growth in the middle 1940s. Landings in New York (Figure 23)

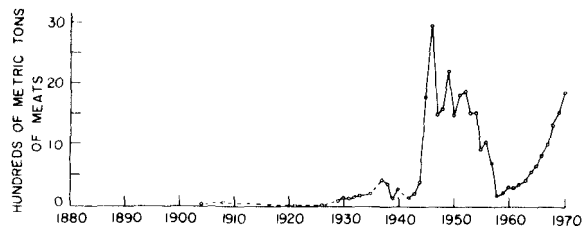

FIGURE 23.—Annual commercial landings of surf clam in the State of New York, 1904-1970.

were relatively small compared with New Jersey, which reached a level of over 43 million pounds (19,600 metric tons) of meats in the late 1960s. But the fishery began off Long Island and shifted south later, as abundance dropped on local beds. The resurgence of the New York surf clam industry after 1958 came about through discovery of new offshore beds and development of more efficient harvesting gear. The future of the surf clam fishery of the State is uncertain because, like all molluscan shellfish resources, this species is extremely vulnerable to overharvesting, and controls are difficult to impose. The history of our shellfisheries is a history of overexploitation, and there is no reason to believe that the surf clam industry will be any exception. This industry grew because the soft clam and oyster industries inshore were declining. The great demand for clams and the current high prices will be great incentives to harvest known resources heavily and to seek out new grounds.

HARD CLAM

In landed value hard clams have been the most important commercial fishery species in New York since 1953. Landings reached a maximum in 1947 of nearly 11 million pounds (4,700 metric tons) of meats, then dropped abruptly to 1954 (Figure 24). Since the middle 1950s landings have climbed steadily from a low of about 2.5 million pounds (1,100 metric tons) in 1954 to nearly 8 million (3,590 metric tons) in 1970. Most of this increase has come from Great South Bay, which in 1959 produced about 1.5 million pounds (680 metric tons) of meats and in 1969 yielded more than 6 million pounds (2,860 met-

ric tons). This almost doubled the percentage contribution of Great South Bay to the total hard clam production of the State.

In discussing this growth of the hard clam industry in New York, Wallace (1971) pointed out that hard clams are much more adjustable to changing environmental conditions than oysters are, even in the larval stages. In Raritan Bay, once the center of oyster production in the area of New York Bight, hard clams still spawn successfully, although much of the bay is badly polluted and oysters are long since gone. He attributed the great rise in hard clam production in New York to a series of excellent sets in several bays on the south shore of Long Island.

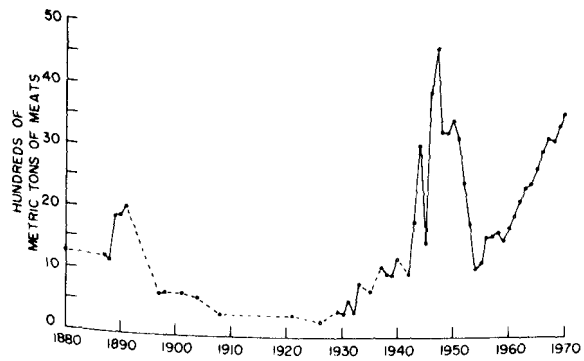

FIGURE 24.—Annual commercial landings of hard clam in the State of New York, 1880-1970.

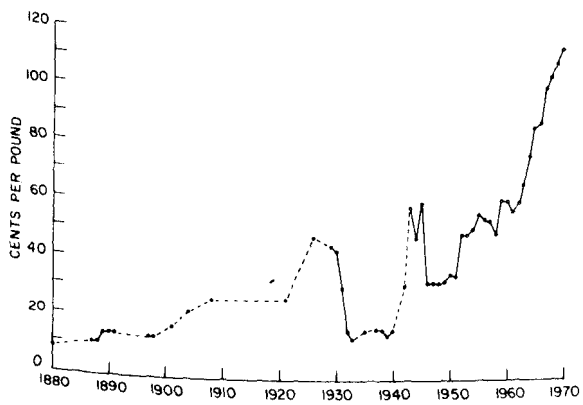

FIGURE 25.—Average annual landed value of hard clam meats in the State of New York, 1880-1970.

It would appear that part of the incentive to harvest clams more intensively has been provided by economic changes. As Figure 25 illustrates, the landed price per pound of hard clam meats has undergone some interesting changes over the years. Prices were high in the affluent days before the depression of the 1930s. In the 1930s they dropped to what probably would be a record low if the figures had been expressed in standard dollars. Prices rose sharply during the war and dropped as sharply immediately afterwards, as did the prices of most seafoods. Then in the 1950s the price of hard clams began to rise and the rise continued even more rapidly in the 1960s. This steady increase over a period of two decades can be explained only partially by the declining value of the dollar. The economic forces operating here must be largely if not completely the collapse of the oyster and soft clam industries and the growing affluence of most segments of the population, which seems always to stimulate demand for the more popular kinds of seafood, especially invertebrates.

STRIPED BASS

Commercial landings of striped bass (*Morone saxatilis*) in New York have been following an upward trend for the past 30 years or more (Figure 26). The same phenomenon has been observed along the Atlantic coast from Chesapeake Bay (McHugh, 1969a) north. The total Atlantic coast commercial catch in 1970 was about 10.5 million pounds (4,770 metric tons). The total

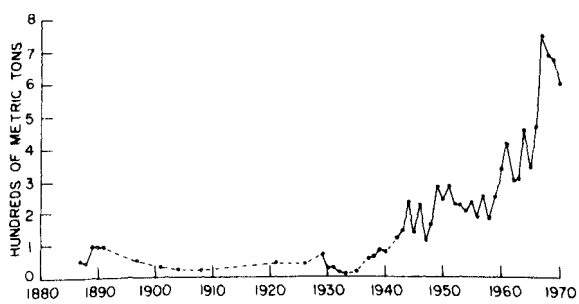

FIGURE 26.—Annual commercial landings of striped bass in the State of New York, 1887-1970.

estimated sport catch in 1965 for the Atlantic coast was between 5 and 6 times the weight of the commercial catch in 1970. The striped bass is an anadromous coastal species, and it has not been reported in catches of foreign fleets fishing offshore.

It seems unlikely that the great increase in striped bass landings over a 35-year period has come about through an equivalent increase in fishing effort, for this species has been popular as a commercial and recreational species for a long time. It has been suggested (Mansueti, 1961) that the species has been able to take advantage of increased nutrient loads in its nursery areas in Chesapeake Bay and elsewhere and that the increased catch has been largely, if not completely, caused by a real increase in abundance. This is entirely hypothesis, and data probably do not exist with which to test it. A small piece of suggestive evidence on a closely related species has been published recently. Tsai (1970), examining changes in fish stocks of the Little Patuxent River, Md., over a period of about a decade, found that some species had decreased considerably in abundance and others had increased. Among the species which had increased was the semi-anadromous white perch (*Morone americana*), which has a life history very similar to that of the striped bass during the first 2 years of its life when it does not move very far from the influence of the river in which it was born.

NORTHERN LOBSTER

Landings of lobster in New York also have been increasing for about 25 years. The maximum catch recorded in the earlier period was a little over a million pounds (470 metric tons) in 1921 (Figure 27). Then the catch fell off rather steadily to a low of about 150,000 pounds (64 metric tons) in 1945. In 1970 about 1.65 million pounds (750 metric tons) were landed in New York. The recent increase has been attributed to two phenomena. The first has been a general decline in coastal water temperatures for the last 10 years, which apparently has brought about a southward shift in the distribution of lobster and an increase in pot catches

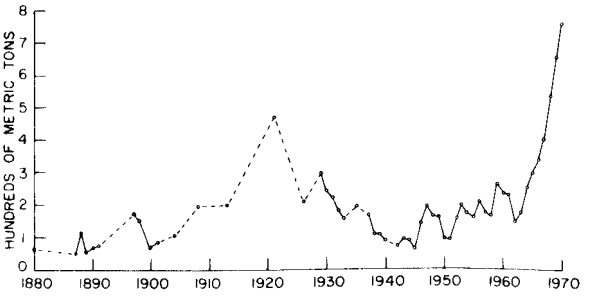

FIGURE 27.—Annual commercial landings of northern lobster in the State of New York, 1880-1970.

inshore. The second has been the increasing exploitation of hitherto unused lobster resources by trawls and pots in relatively deep water on the continental shelf. Graham (1968) stated that several inshore species along the Atlantic coast, including lobster, were producing catches at or beyond levels of maximum sustainable yield and that from now on the fluctuations in annual landings would be the result of fluctuations in recruitment or availability. The relation between the offshore and inshore lobster stocks is not completely understood, but recent investigations seem to be leading to the conclusion that the offshore lobster fishery may be harvesting a distinct stock. If so, it cannot yet be determined how large a catch it can sustain. The future of lobster landings in New York would appear at this time to be uncertain.

CONCLUSIONS

Consideration of trends in landings of some 28 species of marine fish and shellfish in the State of New York shows that the variable commercial fishery production of the State has been maintained by shifting from one species or stock to another as landings of each resource have risen to maxima and then declined, often to very low levels. The reasons for some of these declines or increases are known, but trends in landings of many species remain unexplained. At any point in time in the history of the coastal fisheries of New York, landings of some species are rising, and others declining, and there is no reason to believe that the pattern will change.

Even if a constituency receptive to rational management of the fisheries could be created, only a few of these resources are subject to control unilaterally by the State of New York. Most would require cooperative effort by all States through the waters of which the living resources migrate. Such cooperation has not been possible, although a mechanism exists in the Atlantic States Marine Fisheries Commission to provide cooperative management, if cooperation is really desired. To date, the Commission has demonstrated neither the desire nor the capability for joint management of coastal fishery resources.

In New York it can be expected that the situation may deteriorate further. Since 1962 the total weight of fish and shellfish landed in the State has dropped from more than 112,000 metric tons to about 14,500 metric tons, a decline of about 86% in 8 years. Most of this decline has been in the industrial fisheries, principally menhaden, but food fish landings have dropped also. Over the same period food fish and shellfish landings have dropped from about 18,000 metric tons to about 14,500 metric tons, a decline of about 21%. Indeed, the trend in seafood production has been downward for more than 30 years. Since 1938 New York seafood landings have dropped about 54% from 31,100 metric tons.

The species have been discussed approximately in chronological order of maximum commercial catch. This sequence was chosen because it illustrates rather nicely some of the reasons for the fluctuations observed. The sequence of rise and decline is typical of the evolution of coastal fisheries. Note that the first eight species of food fish and shellfish discussed, with two exceptions, are either molluscan shellfish or relatively nonmigratory species of shallow coastal waters, or anadromous. The two exceptions, bluefish and weakfish, although highly migratory, crowd into coastal bays and estuaries seasonally, where they are highly vulnerable to fishing. These are the kinds of fish and shellfish that support the early fisheries everywhere. They can be taken easily with primitive gear, sometimes without even the aid of a boat, and thus they are extremely vulnerable. To this group can be added menhaden and river herrings.

The next 12 species or groups of species, with only one exception, can be placed in two general categories: fish which come into coastal waters in abundance at times, but which also are abundant offshore; and those which seldom, if ever, come into coastal waters. Among these are demersal species like haddock and tilefish, densely schooling and highly migratory pelagic fishes like mackerel, or mollusks of relatively deep waters like sea scallop or surf clam. Many of these are taken by trawls, dredges, or purse seines, which require relatively large, powered vessels. This requires more capital investment and more manpower, hence calls for more organization and planning. These are the kinds of fish and shellfish to which coastal fishermen turn when the strictly coastal resources no longer can meet market demands. This is the typical evolutionary pattern of coastal fisheries, in which the fleets expand, increase in efficiency, and range out into the ocean and farther from their home bases. Almost all of these fisheries now are declining.

The one exception noted above is the northern puffer or swellfish, which as far as we know is very much a species of the coastal zone, living in shallow waters near shore. As such, it might be expected that the northern puffer fishery would have developed and declined much earlier than it did. The reason probably is that puffers have been regarded as repulsive, and their value as a first-class food fish was not recognized until recently. The well-known toxicity of tropical puffers also may have been a contributing factor.

The last three species discussed—northern lobster, striped bass, and hard clam—interestingly enough, are essentially resources of the coastal zone, which, like the puffer, would be expected to be subject to heavy fishing early, hence produce maximum landings early and then decline. Under most circumstances this might have been so, but special circumstances apply to each. With the lobster it is a matter of increasing availability in New York coastal waters in re-

sponse to natural environmental change and a new offshore lobster fishery on previously unexploited stocks. With striped bass it has been speculated that man-made changes in the environment actually have caused substantial increases in abundance. The recent increase in hard clam production may have a similar cause, but economic factors may also have played a part.

These trends and their relationships can be visualized more clearly by grouping species with more or less similar chronological patterns of landings (Figure 28). The seven groupings here illustrated were derived according to the decade in which the maximum catch was reached. The result forms almost a "textbook example" of the evolution and decline of a regional fishery.

Although the causes of most short-term changes in the landings are complex, the long-term deterioration of certain formerly important fisheries leads to the uncomfortable conclusion that lack of management and overfishing probably are important causes. The oyster, once by far the most important seafood resource in New York by weight or by landed value, today no longer ranks among the 10 most important species. Menhaden, an industrial fish, once the dominant species in New York landings by weight, and far outweighing all other species combined, today ranks eighth by weight, and the industry on which it was based is close to collapse. The oyster catch has been largely a cultivated crop, and in New York the efficiency of cultivation has been superior to that in any area except the Pacific Northwest. The recent decline of the industry has been caused by natural disasters with which the industry was unable to cope. But many of the problems could have been avoided by applying knowledge of the ecology of oysters, according to MacKenzie (1970), and the potential yield is far greater than the industry has ever realized. In other

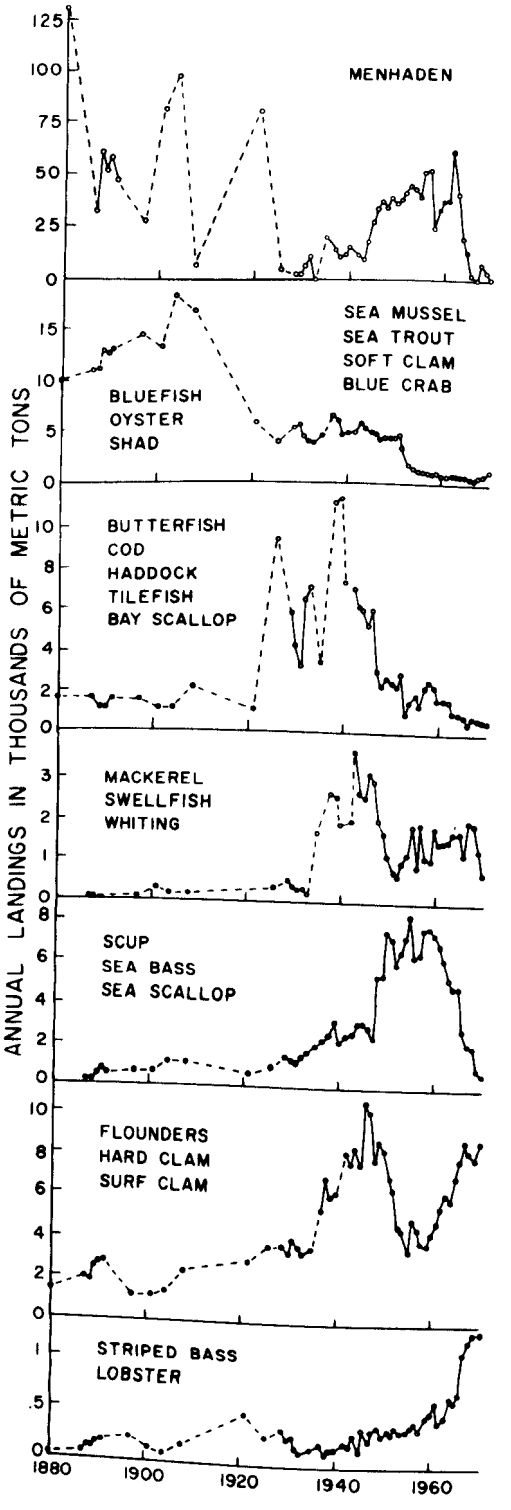

FIGURE 28.—Annual commercial landings of fish and shellfish in the State of New York, 1880-1970. The species have been grouped according to the decade in which the greatest landings were made and the groups are arranged approximately in chronological order of maximum landings. The two peaks in the second graph from the bottom do not represent a shift from one species to another. See text for details.

words, MacKenzie has said that although the methods used by oyster planters in New York were relatively efficient as compared with methods employed in most other parts of the country, they could have been much better, and rehabilitation is possible. This conclusion may be challenged by oystermen, for the studies on which it is based did not consider adequately the economics of oyster planting.

The second most important food fish of the early days was the shad, entirely a wild crop. This fishery has declined just as sharply as the oyster fishery, and the causes are entirely by man: deterioration of the environment in the rivers where spawning takes place and the young live their early lives, overfishing, and lack of effective management measures. The decline of the menhaden industry also can be attributed to overfishing, but in this case in areas to the south, not under the control of the State of New York.

The prospect is bleak. The history of the fisheries of New York, as in so many other coastal States, is a history of mismanagement, or perhaps more accurately a classic example of no effective management at all. As in other coastal States, there has been no dearth of attention to the matter by the public and by government. The laws of New York State include many limitations upon fishing and upon degradation of the aquatic environment, but the history of the fisheries does not attest that these laws have been effective. Perhaps the best that can be said is that if there had been no laws, the decline probably would have been more rapid and more severe.

Two solutions to these problems are popular today. The first begins with the premise that all the problems of the domestic commercial fisheries are caused by foreign fishermen. The proposed solution is that the United States should assume ownership, or at least trusteeship, over the fishery resources of the continental shelf by extending its zone of jurisdiction unilaterally to 200 miles, as several Latin American countries have done. It is argued that the matter is urgent and that we cannot afford to wait for international action at the Law of the Sea Conference in 1973. Supporters of this view, who include most, if not all, people in the fishing industry on the Atlantic coast, believe that nothing useful to them is likely to emerge from the 1973 conference, if indeed any agreement on fisheries is reached, or if the conference materializes at all. Meanwhile, if we take no action, they argue, the situation will deteriorate rapidly.

This argument is open to question for several reasons. Not the least of these is the sorry history of our own attempts to manage the living resources of coastal waters over which we have always had control. This has been demonstrated very clearly for the coastal waters of New York in the present paper, and the record of most of our maritime States is equally bad. Only when we have been compelled to do so under international agreements, as in the salmon fisheries of the Pacific coast, has the United States succeeded in managing any major coastal fishery. If we move unilaterally to extend our fishery jurisdiction, there is nothing in the record to demonstrate that this will amount to anything but a hunting license to destroy the living resources of a much broader zone of the sea.

The second popular solution arises out of the long standing controversy between recreational and commercial fishermen. Most saltwater sport fishermen probably would support a move to extend the width of the fishery zone. In addition, they would welcome restrictions of various kinds on domestic commercial fishermen, on the grounds that the commercial fisheries take large quantities of fish which are more valuable as recreational resources, or that commercial fishermen destroy the food supply or the spawning grounds of recreational species. These tend to be emotional issues in which facts are ignored or distorted and uninformed opinions prevail. Where the sport catch has been demonstrated to exceed the commercial catch greatly, as is apparently true for species like bluefish and striped bass, the question arises whether sport fishing is not more in need of regulation than commercial fishing. The growing sport fisheries are under much less control than the commercial fisheries are, but from a scientific point of view they are equally in need of control if management is to succeed.

SOME QUESTIONS FOR CONSIDERATION

This preliminary study will be the first step in developing a marine fishery program in the State University of New York. The program will be developed in coordination with plans and programs of appropriate State and Federal agencies and other institutions concerned, to complement rather than to duplicate. The university has valuable skills and facilities for investigating aspects of the fisheries that government is not investigating or cannot do. Some of the questions are:

1. Which living resources are amenable to management by the State; and which are not, without cooperation from others?
2. What are the potential benefits of investing public funds in fishery research and management? Are they being realized now? Are they worth pursuing? What should be the priorities?
3. What are the present and potential economic values of marine commercial and recreational fisheries in the State? On what basis should the resources be allocated among users?
4. Can the present alarming trends in the marine fisheries of the State be arrested, and the fisheries stabilized for maximum (or optimum) yield? What will it cost? What benefits will accrue?
5. Does marine aquaculture hold promise for the economy of the State? In what ways? What are the priorities?
6. How can the university best use its capabilities for public education and extension services to create an enlightened constituency for utilization and management of the living resources of the sea?
7. What is the policy of the State toward fishery research, development, and management? Is it a rational policy? Is it working? If not, what should the policy be and how should it be implemented?

These are but a few of the questions that need to be answered, and which the State University is well qualified to answer. They will require the attention of many disciplines, including economics, sociology, government, law, and international affairs, as well as the natural sciences. This historical review has helped to phrase the questions, but it has answered few. It is just the beginning.

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