Fish - classification and identification

Fish and Shellfish of the Middle Atlantic Coast

CONSERVATION BULLETIN NUMBER 38

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Fish and Shellfish of the Middle Atlantic Coast

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CONSERVATION BULLETIN NUMBER 38

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary

OFFICE OF THE COORDINATOR OF FISHERIES
Ira N. Gabrielson, Deputy Coordinator

This publication is one of a series of regional accounts of the fishes and fisheries of the United States, published as Conservation Bulletins of the United States Department of the Interior. The following bulletins in this series have already been issued and may be obtained from the Superintendent of Documents, Government Printing Office, at the prices indicated:

FOOD FROM THE SEA: FISH AND SHELLFISH OF NEW ENGLAND
by Rachel L. Carson. Conservation Bulletin No. 33. 15c.

FOOD FROM HOME WATERS: FISHES OF THE MIDDLE WEST
by Rachel L. Carson. Conservation Bulletin No. 34. 15c.

FISH AND SHELLFISH OF THE SOUTH ATLANTIC AND GULF COASTS
by Rachel L. Carson. Conservation Bulletin No. 37. 10c.

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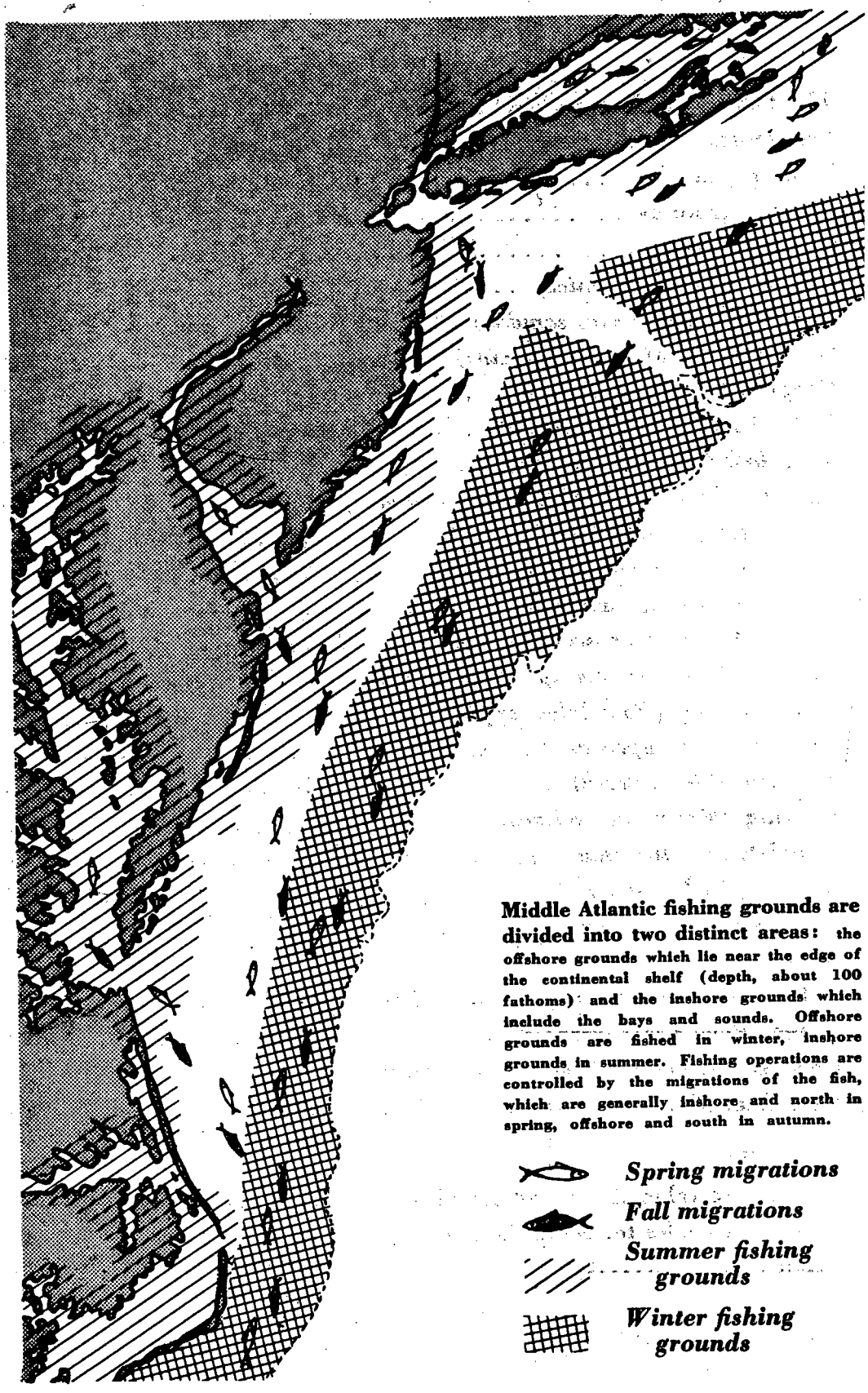
CONTENTS

	Page
The fishery resources	1
Economics	2
Fishing gear	4
Fishing grounds	6
Conservation	7
Oysters *(Ostrea virginica)*	8
Blue crab *(Callinectes sapidus)*	10
Croaker *(Micropogon undulatus)*	12
Porgy *(Stenotomus chrysops)*	13
Striped bass *(Roccus saxatilis)*	14
Weakfish *(Cynoscion regalis)*	15
Summer flounder *(Paralichthys dentatus)*	16
Shad *(Alosa sapidissima)*	17
Butterfish *(Poronotus triacanthus)*	18
Spot *(Leiostomus xanthurus)*	19
Mackerel *(Scomber scombrus)*	20
Menhaden *(Brevoortia spp)*	22
River herring *(Pomolobus spp)*	23
Sea bass *(Centropristes striatus)*	24
Eel *(Anguilla rostrata)*	25
Whiting *(Merluccius bilinearis)*	27
Kingfish *(Menticirrhus spp)*	27
Bonito *(Sarda sarda)*	27
Mussels *(Modiolus demissus)*	28
Scallops	
Bay *(Aequipecten plagioctenium irradians)*	28
Sea *(Placopecten grandis)*	28
Hard shelled clam *(Mercenaria mercenaria)*	29
Surf clam *(Mactra solidissima)*	29
Appendix	
Nutritive value of fish and shellfish	30
General guides for selecting and preparing fish	30
Bibliography	32

FISHING GROUNDS



Middle Atlantic fishing grounds are divided into two distinct areas: the offshore grounds which lie near the edge of the continental shelf (depth, about 100 fathoms) and the inshore grounds which include the bays and sounds. Offshore grounds are fished in winter, inshore grounds in summer. Fishing operations are controlled by the migrations of the fish, which are generally inshore and north in spring, offshore and south in autumn.

Spring migrations

Fall migrations

Summer fishing grounds

Winter fishing grounds

THE FISHERY RESOURCES

The Middle Atlantic region[1] is a natural division of the Atlantic coast in both a geographic and a biological sense. Its geographic boundaries are clearly defined: on the south Cape Hatteras, the most easterly seaward projection of the North Carolina shore; on the north Cape Cod. Biologically, the fauna of this long, curving Middle Atlantic shore is distinct from that of the North and South Atlantic coasts. Cape Hatteras and Cape Cod are natural boundaries of the marine world. There is some straying beyond them, some overlapping of ranges, but for the most part the truly southern, tropical or semi-tropical fishes live below Hatteras, the typically cold water fishes beyond and north of Cape Cod.

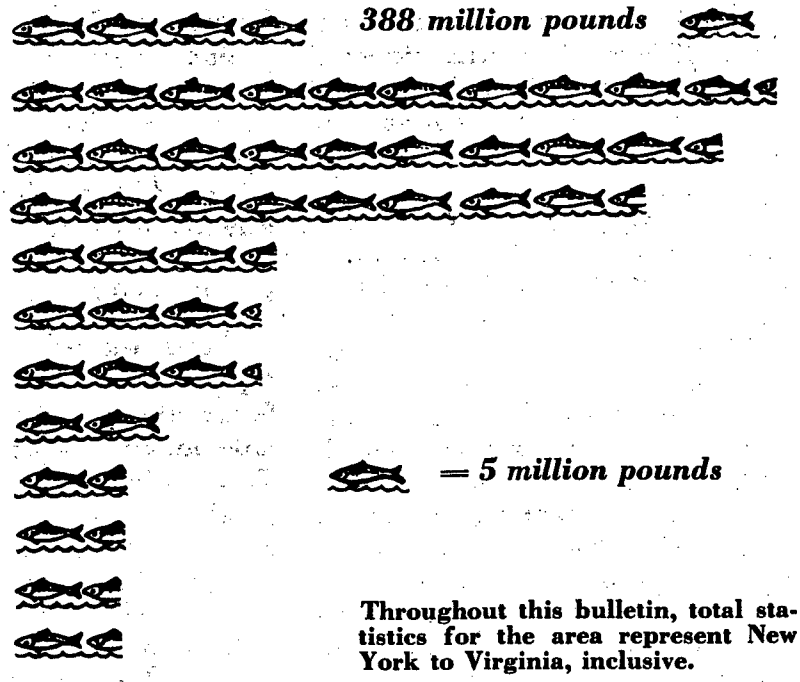
Most characteristic of the Middle Atlantic fauna is a group of 60 or more species collectively known as shore fishes. They are a migratory group, their migrations are seasonal, and for generations their movements have determined the character of the fisheries of the region. In the spring and summer, shorefish move in to coastal waters, including bays, sounds, sometimes river estuaries. They tend to be more concentrated at this season toward the northern part of their range. In the fall and early winter they migrate to offshore more southerly wintering grounds.

Formerly the shorefish were taken only during the spring, summer, and fall, when on the inshore grounds. No one knew exactly where the fish went in winter, nor how to follow and capture them. About 1930, however, the offshore winter home of the shorefish was discovered; gear and vessels were developed which were suitable for fishing these grounds in stormy winter weather. Now intensive winter fisheries have grown up, working the offshore area from about 80 miles off New York City all the way to the vicinity of Cape Hatteras, and shorefishes come into the markets throughout the year.

While the shorefishes are most typical of the Middle Atlantic fauna, they are not the most valuable aquatic resource of the region. This distinction falls to oysters, the product for which the region is best and most widely known. Since the earliest beginnings of the oyster industry, the Chesapeake Bay has held first rank as a producer of oysters. The area as a whole now provides more than half of all the oyster harvest taken in United States waters, and its fishermen receive approximately eight million dollars for this single aquatic crop. (Fishermen's income from all Middle Atlantic fishery products: about 22 million dollars.)

Other special resources give the Middle Atlantic region a unique position as a source of aquatic foods. Nearly two-thirds of the catch of Atlantic coast crabs is taken in this area, mostly in Chesapeake Bay. Receiving the drainage of the mightiest rivers of the Atlantic coast—the Hudson, the Delaware, the Susquehanna, and the Potomac—the Middle Atlantic region is the center of the fisheries for shad and river herring, species which live most of their lives in the sea, but enter fresh water to spawn. The area provides more than half the total catch of menhaden, first ranking Atlantic coast fish in volume of production. Its waters yield the first mackerel, swordfish, and tuna of the season, since each of these oceanic wanderers enters coastal waters north of Hatteras as it turns shoreward in spring.

[1] To avoid duplication of material presented in other publications of this series, only that portion of the Middle Atlantic area from Cape Hatteras to the eastern tip of Long Island is treated in this bulletin. The fishes of southern New England have been described in Conservation Bulletin No. 33.



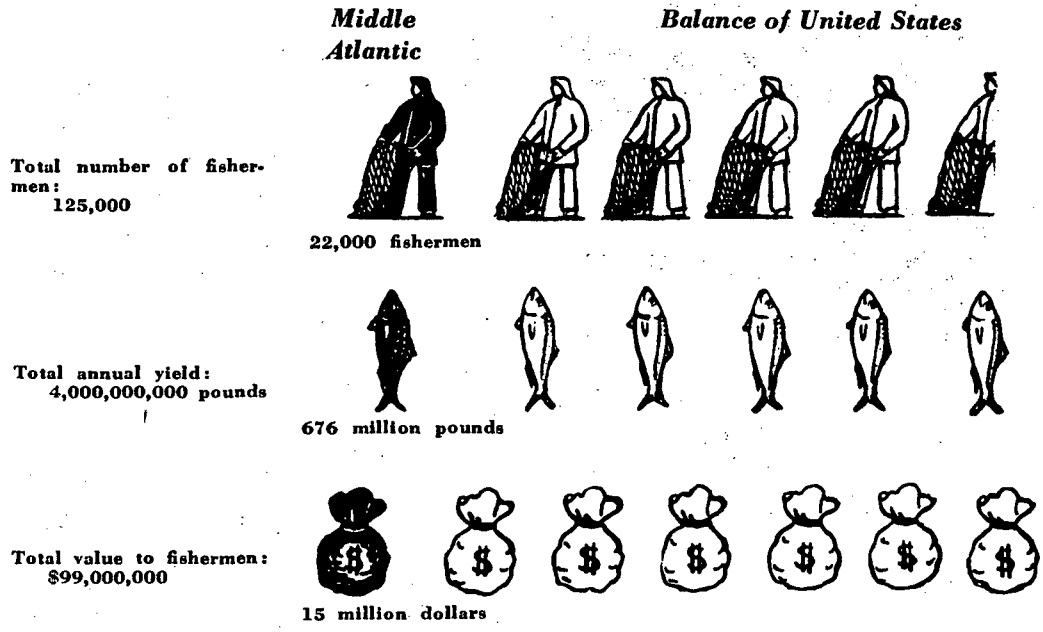
Throughout this bulletin, total statistics for the area represent New York to Virginia, inclusive.

CATCH OF PRINCIPAL SPECIES, 1940

With few exceptions the Middle Atlantic fisheries are carried on by individual fishermen or by small associations of fishermen. In this respect they contrast sharply with the fisheries of New England and the Pacific Coast, where the typical operating unit is a large company, with financial stability and large resources of material and equipment. The only important exceptions to the lack of organization in the Middle Atlantic area are the menhaden fishery, dominated by several large companies owning chains of factories and many boats, and the oyster industry of Long Island Sound and sections of New Jersey and Virginia. The pound net fisheries, as a rule, are carried on by fishermen organized into groups of some size.

The small scale of most of the Middle Atlantic fishery operations has important effects which are seen in the methods of handling the catch. With the exception of menhaden, utilized almost entirely in the production of meal and oil, most of the catch goes into the fresh fish trade. Some filleting and freezing is done. However, facilities for freezing, processing, and storing fish have been inadequate in the past, remain so at present. Efficient use of the Middle Atlantic fishery yield cannot be made until shore plant facilities are expanded. A characteristic feature of the fisheries of the region is their seasonal peaks of heavy production. Without means to process, freeze, and store fish caught during these periods, inevitable waste and inefficiency result.

Markets for the products of the Middle Atlantic fisheries are largely confined to eastern United States. The large coastal cities of the area itself — New York, Philadelphia, Baltimore, Washington, Norfolk, and Richmond—all consume large quantities of seafood, absorbing much of the local supply. From the Chesapeake Bay area, heavy shipments go south and west to Georgia, the Carolinas, Tennessee, Kentucky, and southern Ohio. Jersey-caught whiting finds a large market in St. Louis and Kansas City. With the exception of canned clams, which are distributed through the grocery trade, and the widely marketed oyster, little Middle Atlantic sea-

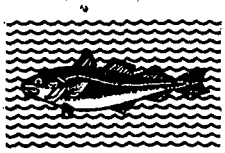


food is sold west of the Mississippi River.

On the other hand, the Middle Atlantic area is an active market for fish and shellfish produced in other areas. New York's busy Fulton Market handles almost every kind of aquatic food taken on the Atlantic coast, even receives many Pacific coast fishes. Red snappers, shrimp, mullet and Spanish mackerel from the south; cod, hake, haddock, and herring from New England; salmon and halibut from the Pacific coast states and Alaska; spiny lobster tails from South Africa—these are only a few of the fish seen in this colorful waterside market. Here also are to be found marine oddities seldom available anywhere else, seldom eaten in America except by such cosmopolitan populations as New York's: Bushels of periwinkles or small marine snails, baskets of spine-studded sea urchins, squids, octopuses, skate wings, puffers, angler fish. Not only marine fish find ready sale in New York: this city is the largest market in the country for fresh water species. It buys large quantities of carp and buffalofish from the Mississippi River and its tributaries, almost every kind of fish caught in the Great Lakes, and lake fish from the Canadian provinces as far west as Alberta.

With the exception of some of the more bizarre items, the markets of Philadelphia, Baltimore, and Washington handle, on a smaller scale, a similar variety of seafoods. A somewhat larger proportion of fish native to the area are sold in these cities, and in the smaller cities and towns of the region the reliance upon locally produced fish becomes more marked.

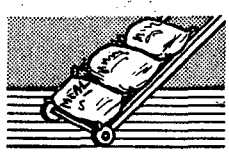
THE 676 MILLION POUNDS OF FISH AND SHELLFISH TAKEN IN THE MIDDLE ATLANTIC AREA IN 1940 WERE PROCESSED AS FOLLOWS:



262,589,000 pounds were sold fresh or frozen.

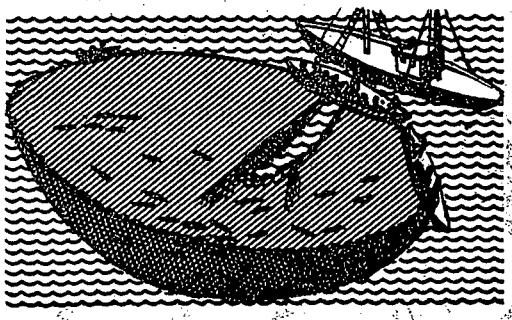
7,600,000 pounds were canned.

13,000,000 pounds were cured.

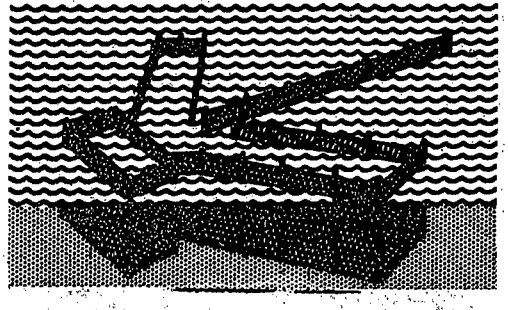


393,100,000 pounds were made into by-products.

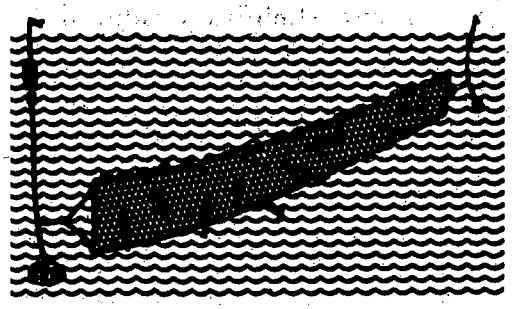
FISHING GEAR



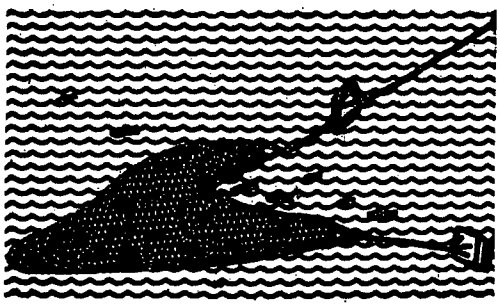
PURSE SEINES, from the standpoint of volume of production, are the most important gear in the Middle Atlantic area. They account for almost two-thirds of the total catch of the region—more than 400 million pounds annually. However, most of this catch is menhaden, a fish used in the manufacture of animal feeds and oils, seldom directly as human food. Purse seines are the chief gear of the mackerel fishery, also take sea trout, porgies, croakers. They are useful for any fish that school in large numbers at the surface where they are visible, but cannot be used when fish swim deep. Mackerel seiners on the Atlantic coast carry smaller seine boats, which do the actual work of setting the net around a school of fish. The net is then pursed by drawing in lines run through its lower border. The fish are gradually concentrated in one part of the net, then the vessel comes alongside and takes the catch aboard.



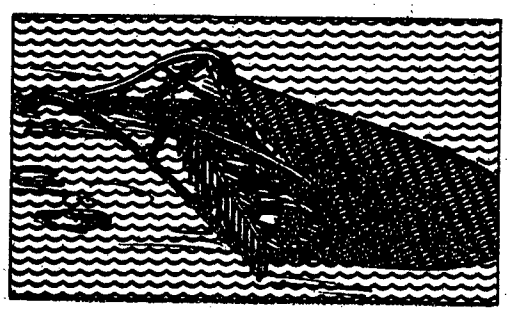
POUND NETS take most of the butterfish, porgies, sea trout, and croakers caught in the spring, summer, and fall, are the principal gear for shad and herring in North Carolina sounds and the Chesapeake Bay, also take quantities of whiting and mackerel. Most pound nets are set in rivers, bays, and sounds, making heaviest catches spring and fall when fish are migrating to and from deeper ocean waters. Large ocean pounds are used offshore. Because of the depth of the water these require poles up to 90 feet long, driven into the bottom with hydraulic jet pumps. Severe storms may destroy an entire trap, which costs $5,000 to $8,000. Netting is hung on inshore pounds as soon as the fish move shoreward in spring. Offshore pounds, more subject to weather hazards, are rigged for fishing about mid-April off New Jersey, somewhat later farther north. They are fished as late as December off New Jersey.



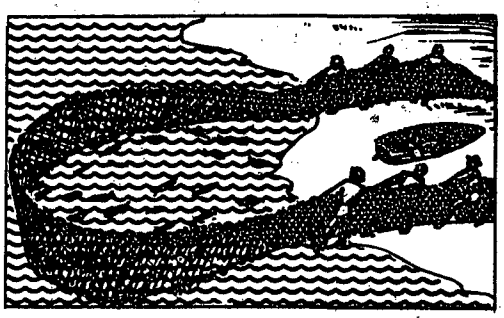
GILL NETS are set perpendicularly in the water, like a tennis net, to intercept migrating fish. In attempting to pass through the net, the fish put their heads through the meshes and become entangled by the flaps which cover their gills—hence the name. Some gill nets are anchored in position, some are attached to stakes, others are so arranged that they drift with the tide. Shad fishermen of the Hudson River use more gill nets than any other type of gear. Small but important gill net fisheries for mackerel operate offshore. Weakfish (sea trout), striped bass, and croakers are other fish taken in this gear.



OTTER TRAWLS are baglike nets which are towed along the bottom to pick up fish in their path. They are of two kinds: one a heavily weighted net which is dragged close to the ocean floor for such groundfish as flounders; the other a "balloon" net which is buoyed a little off the bottom by floats, is towed rapidly, and takes fast, schooling fishes like porgies, whiting, and butterfish. Otter trawls are especially effective gear because, unlike stationary pound nets, they can follow the fish. Small trawlers, known as draggers, operate inshore for fluke and other species all summer. By far the greater part of all winter fishing on the Middle Atlantic coast is done by otter trawlers, which fish the offshore waters all the way from Cape Hatteras to Montauk.



DREDGES, used in fisheries for oysters, clams, crabs and scallops, are operated from power boats. Largest dredges (9 to 12 feet across) are used for sea scallops, which are scattered, thus hard to find with narrower gear. Oyster dredges are 4 to 6 feet wide. Because of the weight of the oysters, the dredges have heavy frames, teeth fairly long and close together, bag wholly or in part of metal rings. Clam dredges, which are 2 to 3 feet wide, have longer teeth for digging the clams out of the bottom sand. Crab dredges have shorter teeth, are of generally lighter construction than oyster dredges, and use cotton twine bags. Dredges without teeth—known as scrapes—are used to take soft crabs.



HAUL SEINES are operated from shore to take fish that are concentrated close to the beaches. The seine is dropped in a wide circle offshore and is then hauled toward the beach, encircling the fish. Hauling is done by hand (small seines) or by power (large seines). Some of the largest haul seines are operated in the lower Chesapeake, and the sounds of North Carolina, taking spot and croakers. Weakfish (sea trout) are taken in night seining in the Peconic Bays of Long Island in summer.

OTHER GEAR used in the Middle Atlantic fisheries includes tongs for oysters and clams; trawl lines and hand lines—used especially for cod in the winter months; pots for sea bass, eels, crabs, and lobsters; rakes, forks and hoes for various shellfish. Fyke nets are used in the river fisheries for catfish, carp, and perch, also take miscellaneous other species. Baited trot lines are one of the principal gears of the Chesapeake Bay crab fishery.

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FISHING GROUNDS

The fishing grounds of the area extend from Montauk Point at the eastern tip of Long Island to Cape Hatteras, a long, curving shore line indented by an almost continuous series of bays and sounds. Large bodies of protected water—Long Island Sound, Delaware and Chesapeake Bays, Albemarle and Pamlico Sounds — provide unusually favorable conditions for the development of fisheries. Numerous smaller inlets of the sea offer seasonal fishing for commercial fishermen and anglers.

The Middle Atlantic shore is bordered by a broad continental shelf, widest off Long Island—about 125 to 150 miles — narrowing to about 30 miles off Hatteras. This shelf provides vast feeding grounds for fish, supporting the large shorefish populations of this area. Although in places there are areas of shallow water—known to fishermen by distinctive names like Winterquarter Shoals, Five Fathom Bank —these shoals are not as numerous or as extensive as the fishing banks of North Atlantic waters, and for the most part the fishing areas are less concentrated.

Inshore, coastal fisheries have been carried on for several generations. The offshore fisheries are a more recent development. These grounds are fished not only by boats from the Middle Atlantic area itself, but draw trawlers from New England ports.

Long Island is little more than 100 miles from tip to tip, yet its shoreline measures about 600 miles. Between the mainland and the island, the Sound is famous for its oyster beds, also has its populations of clams and scallops. Principal clam beds, however, are on the ocean side of the island. This southern coast, facing the open ocean, yields larger catches of market fish than any other section of the island. Here the great ocean pounds are set; here numerous harbors offer anchorage for the trawlers. Most important, however, is the fact that this southern shore lies directly in the path of the great northward fish migrations in the spring.

Long Island has long been known for its sport fishing: weakfish, flounders, and porgies in its bays, striped bass, weakfish, and bluefish along its ocean beaches.

Chesapeake and Delaware Bays are the summer home of large segments of the shorefish populations. Heavy runs of weakfish or sea trouts, porgies, croakers, spot, and flounders enter the bays in spring, leave in the fall or early winter as the shallow waters grow cold. Pound nets within the bays intercept the runs, making their heaviest catches at these seasons. In some areas the pound net fisheries are active throughout the summer, supplemented by haul seines, gill nets, and other gear. The Chesapeake Bay in particular is noted for the oysters and crabs which thrive in its protected waters, less salty than the open ocean. Both bays are centers of sport fishing, especially for sea trout, flounders, croakers or hardheads, and striped bass.

The sounds of northern North Carolina are centers of fishing for anadromous and fresh water species. In Currituck Sound the fisheries are chiefly those for carp, catfish, gizzard shad, white perch, crabs. South and west of Currituck is Albemarle Sound, its waters freshened by the large inflow from the sluggish Chowan and the muddy Roanoke. Heavy runs of shad and herring enter the Sound, support its principal fisheries. An active fishery for catfish is carried on here. Pamlico Sound is directly in the path of the runs of shad and herring. Most of the migrating fish come in from the sea through Hatteras and Oregon Inlets, cross Pamlico Sound en route to their fresh water spawning grounds. Many pound nets are operated here, also in narrow Croatan Sound through which the runs must pass to enter Albemarle.

Conservation of the fishery resources of the Middle Atlantic region requires close interstate cooperation. To an unusual degree, the various parts of the area are dependent upon each other for the maintenance of their fisheries. This is largely because of the migratory habits of the shorefish populations. The same stock of fish may be subject to capture by fishermen of different states at different seasons of the year (examples: croakers, porgies, flounders), or at different periods in their lives (example: weakfish, see page 15). Only carefully coordinated measures to protect these stocks from depletion or to increase their productivity can be effective.

Another reason for the interdependence of the Middle Atlantic fisheries is the fact that parts of the area—notably Chesapeake Bay—are important nursery grounds, providing especially favorable conditions for spawning and survival of the young fish. Some of the fish produced in these areas migrate elsewhere, support important fisheries in other sections. Outstanding example is the striped bass: the Chesapeake Bay supplies most of the bass taken farther north along the Atlantic coast.

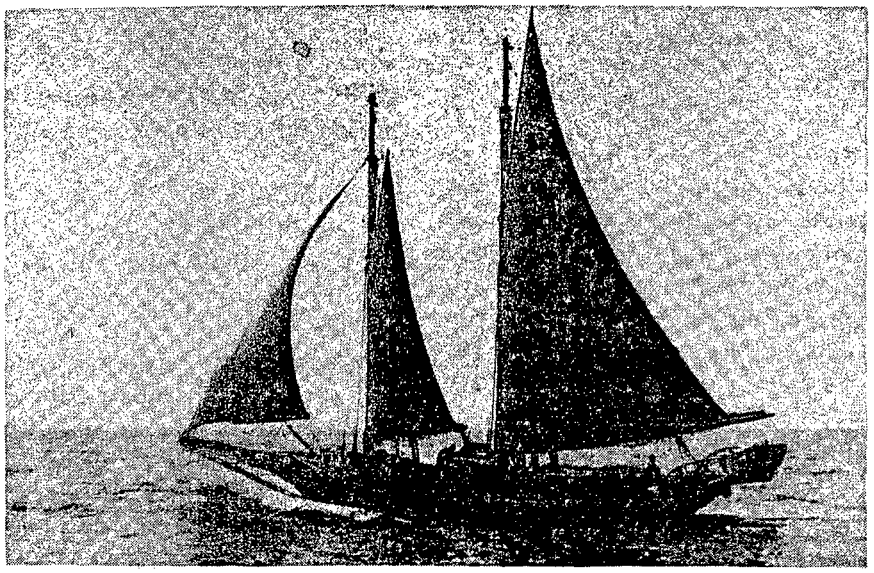
The anadromous fishes of the region — shad and herring — need strong positive action to restore runs and prevent further depletion. This has been done with marked success in the Hudson River. In places such as the Delaware River, there is little hope of rebuilding the runs until pollution is brought under control. In other areas, the intensity of fishing operations must be adjusted to allow more shad to spawn. Dams in some Atlantic coast rivers are absolute barriers to migrating fish. Whether satisfactory fishways can be devised for the passage of shad and herring is a problem for future solution.

The shellfish resources of the region, great as they are, suffer from lack of management by modern, scientific methods in many parts of the area. This is largely because, with few exceptions, the practice is merely to harvest the crop from the public grounds with little or no provision for replenishment, with no systematic cultivation. Legal barriers in some states have prevented the modernization of shellfish management. However, recent progress has been made in some areas toward the development of a system of state-managed cultivation.

In the Middle Atlantic region there are no new, undeveloped fishing grounds awaiting discovery and exploitation, no important resources of fish or shellfish now underutilized. The future development of the fisheries as a source of food and of economic wealth to the area depends upon better utilization of the existing resource. This requires adjustment of fishing operations in such a way as to stabilize production, a goal which can be realized only by measures based on scientific studies of the aquatic resources and by continuous observation of changing conditions. It also demands improvements in the technological field—better methods of handling, processing, and distributing the catch.

Like all other living resources, the fisheries of the Middle Atlantic region are not static, but are undergoing constant change. The nature of these changes may often be influenced or controlled by man. Whether the Middle Atlantic fisheries will realize their full importance and value to the area and to the nation depends on the character of the conservation program followed in future years.

OYSTERS



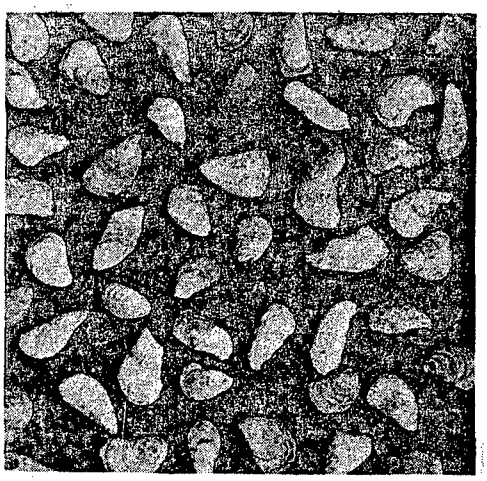
The Middle Atlantic area is the source of more than half the oysters produced in the United States, yielding annually about 50 million pounds, of which 35 million come from the Chesapeake Bay. Oysters are the most valuable aquatic crop of the region. They brought fishermen, in recent prewar years, an annual income of about 5 million dollars. In the country as a whole, they rank second only to salmon in value.

The eastern oyster is one of three species taken commercially in the United States, the other two being found on the Pacific coast. The oyster taken from Massachusetts to Texas is intermediate in size between the small Olympia oyster of Puget Sound and the giant Pacific or Japanese oyster.

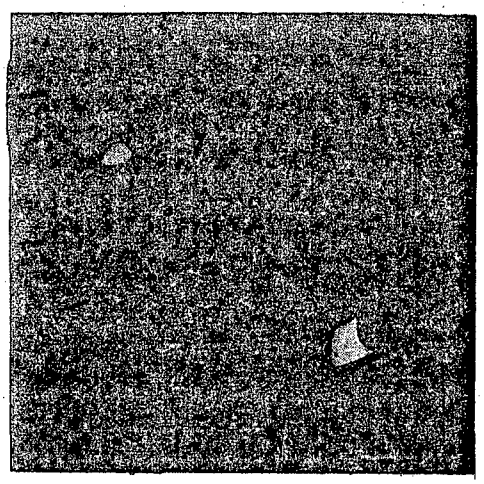
Oysters are mollusks that grow best in shallow waters, never abundantly in the open ocean. They thrive in enclosed bays, sounds, and river mouths, where the salinity of the water is reduced by the flow from tributary streams. In the Chesapeake and Delaware Bays, and in Long Island Sound, they may grow some distance offshore, in water 30 or more feet deep. On good hard bottoms, where oysters are not crowded, the shells are flat and rounded. On muddy bottoms or on overcrowded reefs they tend to grow in clusters of long, misshapen shells.

Oysters spawn in the summer, earlier in the south, later in the north where the water is colder. The female oyster is very prolific, producing from 15 million to 114 million eggs at one spawning, several hundred million in a summer. This high fecundity is balanced by a high mortality rate: of the larvae developed from the fertilized eggs, comparatively few live long enough to settle down on the bottom, at the age of about two weeks, and attach themselves to clean shells, rocks, or other hard objects. Those that do survive are subject to the attacks of starfish, marine snails, boring sponges, and other natural enemies. They must, in addition, compete with their fellows for food and room to grow. Once a young oyster has "set" or become attached to the subsurface, it never moves of its own accord, except for slight changes of position made by oysters living on muddy bottom.

About half the Middle Atlantic crop of oysters comes from public grounds, half from privately leased



Yield from one square yard of cultivated ground (1,000 bushels per acre). Oysters attain full growth and desirable shape when cultivated and transplanted. Segregated by growers according to age, their size is uniform, making marketing easier.



Yield from one square yard of severely depleted uncultivated rock (11 bushels per acre). Years of fishing without reseeding the grounds or protecting the oysters from their natural enemies have reduced the yield to a worthless remnant.

and cultivated beds. The more northerly states of the group, New York and New Jersey, follow the New England practice and have developed large private industries. Delaware takes about a third of its yield from private beds, Virginia about three-fourths. Maryland, however, which produces more oysters than any other state in the country, takes all but a negligible amount from the public rocks. The small oyster production in North Carolina is entirely from public grounds.

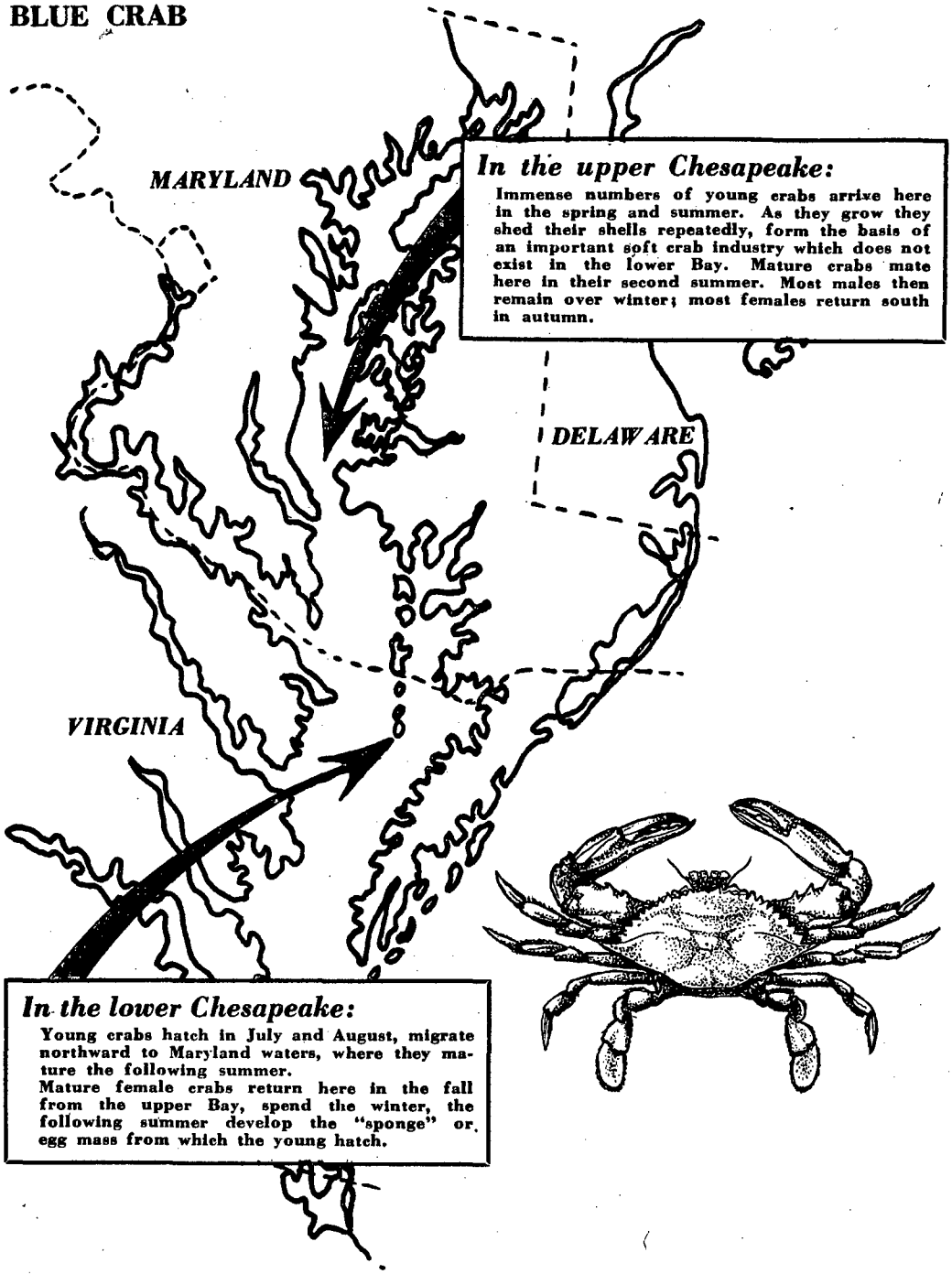
Oyster cultivation on underwater farms has much in common with agriculture. As in land farming, the cultivated product is superior in quality to the wild. Several basic operations are involved. The bottom is cleaned and planted with shells to receive the young oysters. After the larvae have set they are allowed to grow for several months, then, as seed, are transplanted to growing grounds. With further growth they may be transplanted one or more times to other areas, to assure them plenty of space and food. In this way full growth and a good shape are assured. Finally, the oysters are harvested, graded, and shipped to market.

Most oysters harvested in the Middle Atlantic area are sold as shucked meats. A gallon of eastern oysters contains from 150 to 300 oysters, depending on their size. Present demand for shelled oysters comes chiefly from hotels and restaurants. Canning of oysters is not carried on in this area, but is centered in the southern states.

The oyster feeds by drawing through its gills large quantities of seawater from which it strains its food—microscopic plants and animals. Because of its diet, it is a rich source of minerals such as copper, iron, and iodine. It also contains most of the essential vitamins, protein of high nutritive value, and starch in the easily digested form known as glycogen.

Area catch in 1940:
51,440,000 pounds

BLUE CRAB



BLUE CRABS have an extensive range along the Atlantic coast—from Massachusetts at least to the northern part of South America. They are animals of the shallow bays, sounds, and river channels, seldom found far out at sea, sometimes reported in fresh water. In summer the crabs live close inshore, but in winter move off into deeper water to escape the cold. They do not appear to migrate extensively up and down the coast; probably each section has its own local population.

The blue crab resources of the Atlantic coast yield nearly 80 million pounds annually, of which 60 per cent is taken in the waters from New York to North Carolina. Chesapeake Bay is the chief source of crabs, yielding about 42 million pounds annually.

Crabs have an interesting and complex life history, which has been carefully studied in the Chesapeake. The seasonal migrations are especially important, having a direct bearing on the problem of conservation.

Every year between the first of June and the end of August, a new generation of crabs is produced. The female extrudes the eggs, each about one one-hundredth inch in diameter. These remain attached to the female in a large yellowish mass known as the sponge. The eggs hatch in about 15 days.

As the young crabs grow they shed their shells repeatedly and in about a month assume a crablike form. Thereafter the crab molts about 15 times before reaching maturity—at first every 6 days, then after gradually lengthening periods until about 25 days elapse between the final molts. Ordinarily the crab gains about one-third in size with each molt. Crabs reach their full growth and maturity, and cease to molt, during their second summer, when 12 to 14 months old.

The so-called "soft crab" is not a distinct species; the term is applied to any crab that has shed its old shell, in the interval until the new shell has hardened. As the soft-shelled crab is considered especially choice, large numbers of young crabs are sought in the spring and summer while they are still molting. It is customary to place crabs that show definite signs of approaching the shedding stage in floats. If thus imprisoned too early, however, the crab will die without shedding; hence State laws prohibit the impoundment of crabs which have not reached the "peeler" stage. A peeler crab can be detected by a pink "sign" on the last pair of legs, indicating that the new shell is fully formed underneath the old one.

Usually the first spawning takes place when the female is about 2 years old. Some females are believed to live over another winter and deposit more eggs when 3 years old; probably few or none live longer than this. Presumably the life span of the male is about the same length.

Most of the young crabs hatched in the lower Chesapeake Bay soon begin a northward migration. Cold weather interrupts this journey, and they settle to the bottom and cease to feed or grow until conditions are more favorable. In the spring their migration is resumed, growth proceeds, and finally they reach Maryland waters as nearly mature crabs. The mating of the majority of the crabs takes place in Maryland. After mating, the females return to the lower Bay, but most of the males remain behind, spending the winter in deep holes or creeks and rivers. Only about a fifth of the crabs taken in the lower part of the Bay during the winter are males. Nearly all the sponge bearing crabs are found in Virginia waters.

Soft crabs are shipped alive to market, while most hard crabs are steamed near the place of capture, the meat picked out of the shell, and shipped to market in iced containers. Crab meat is also canned in some sections of the country, especially in South Carolina and Louisiana.

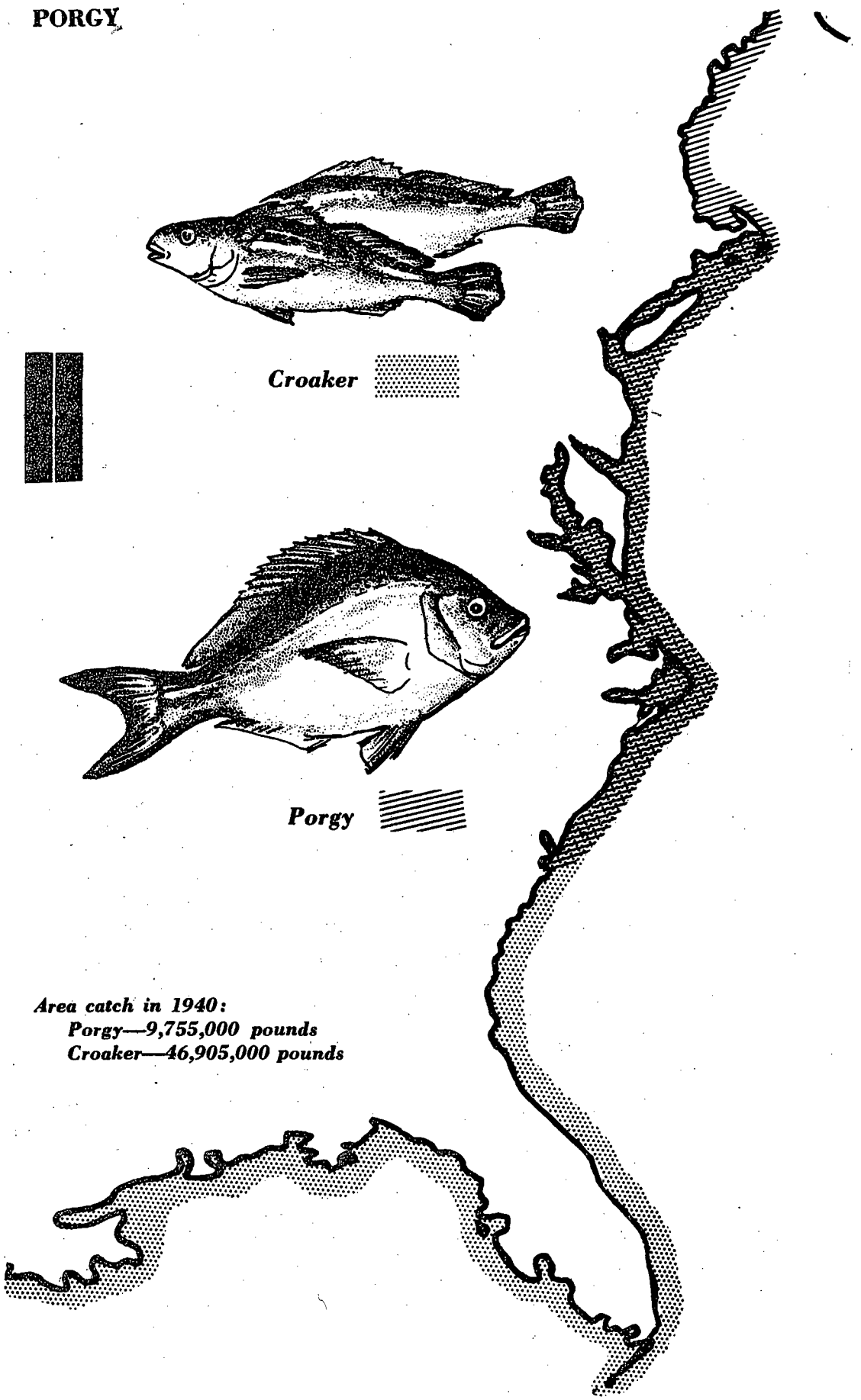
At the present time, the most important markets for fresh crab are the cities of the Atlantic seaboard. Improved handling and marketing facilities, and the further development of the canning industry, will probably create wider markets in the near future. However, the conservation problem remains to be solved. The Chesapeake crab fishery has been subject, throughout its history, to extreme fluctuations in yield, catches ranging from 20 to 60 million pounds. Studies are now under way to learn whether it is possible to control these natural fluctuations, and so stabilize production.

Area catch in 1940:
43,038,000 lbs.

PORGY

Croaker

Porgy



Area catch in 1940:
Porgy—9,755,000 pounds
Croaker—46,905,000 pounds

THE PORGY—called scup in New England—is a common shore fish of the Atlantic coast, marketed chiefly in New York, Philadelphia, Norfolk, and other cities of the Middle Atlantic region. It is available throughout the year, is sold chiefly as fresh, pan-dressed fish rather than in fillets. Summer fisheries for porgies are concentrated in Jersey, New York, and Rhode Island, winter fisheries offshore from the Jersey Capes to Hatteras.

During recent years the catch, especially in New York and New Jersey, has been increasing. This is due to several causes: temporary increase in abundance (the result of several years of unusually successful spawning) and increases in the number of boats and the effectiveness of their gear. However, a succession of poor spawning years could easily reverse the present upward trend. Rather severe fluctuations in the catch have, in fact, marked the history of this fishery.

Otter trawls take about three-fourths of the total catch of porgies. Ocean pound nets and floating traps, especially off Rhode Island, Long Island, and New Jersey, also take important quantities. The porgy is one of the principal species taken in the offshore winter trawl fisheries.

In addition to its commercial value the porgy is more and more sought by the salt water angler. Open boat fishermen go out from Montauk, the south shore of Long Island, and Cape May, N. J., to fish for it.

Porgies spawn in the inshore waters and bays of New Jersey, Long Island, and southern New England from May until August, then begin to move offshore. The young reach a length of some 4 inches by the end of their first summer. By the fifth year they average 10 inches in length, three-fourths of a pound in weight. Market sizes range from three-fourths of a pound to one and a half pounds.

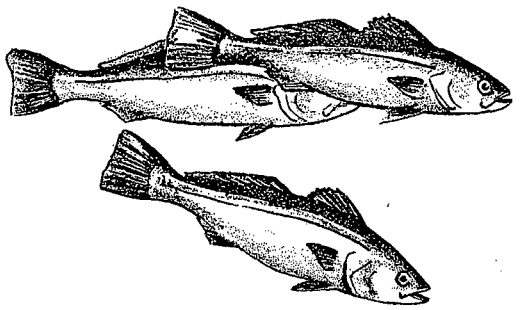
THE CROAKER or HARDHEAD occurs in fishermen's catches anywhere from Cape Cod to Texas, but north of New Jersey and south of North Carolina there are no important fisheries for the species. It is, however, one of the principal market fishes of the Middle Atlantic section. After Virginia, where about three-fourths of the total catch is taken, the most important fishing centers are North Carolina and New Jersey.

Its comparatively small size—market fish averaging half a pound to about two pounds—places the croaker in the pan-fish category. It is usually sold whole, is sometimes filleted.

The croaker was once exclusively a summer fish in the Chesapeake Bay and northward, taken only during the warm months when the fish were in coastal or inside waters. Now fishermen follow them offshore in winter, and fresh croakers appear in local markets every month of the year.

In March, April, and May the pound netters in Chesapeake Bay and on the Jersey coast find the cribs of their nets filled with croakers. After the first of June they take fewer as the fish scatter. Bay anglers take many croakers during the summer. In the fall the temperature of air and water drops; the croakers begin a mass exodus from the inshore waters. Pound netters again make heavy catches. By mid-December the fish have left the coast, moving to their offshore winter grounds. There they form an important part of the catch of the winter trawlers. The total catch has increased greatly since the development of this winter fishery.

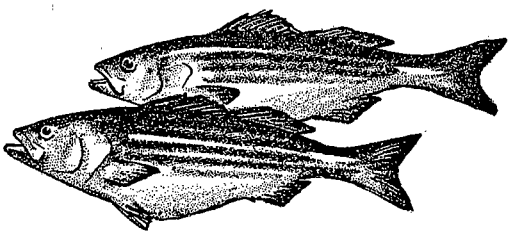
STRIPED BASS



Weakfish

Area catch in 1940:
Weakfish—18,465,000 pounds
Striped Bass—2,221,000 pounds

Striped Bass



THE STRIPED BASS or ROCKFISH is well known to anglers, commercial fishermen, and the general public along the Atlantic coast, where its range is extensive. It also has a limited distribution on the Pacific coast (where it was introduced in 1879) but is reserved as a sport fish in California.

The Chesapeake Bay is the center of abundance of the Atlantic coast stock, furnishing two-thirds of the commercial catch. Most of the bass are taken in pound nets; smaller quantities in haul seines, gill nets, and other gear. Striped bass fisheries are active in the Chesapeake throughout the year. Largest catches in New Jersey and Long Island are made in the fall.

Hundreds of rod and reel fishermen all along the coast seek the striped bass. Surf casting and trolling are their favorite methods.

Most of the catch is sold in the fresh fish markets, but minor quantities are frozen. The larger bass are often filleted or steaked; market sizes of the whole fish run from 2 to 40 pounds. Cities of the Middle Atlantic area are all important markets for the species.

The striped bass is a fish of the coastal waters, seldom being taken more than a mile or so at sea. Although it is most often found in salt water, it sometimes ascends coastal rivers for several hundred miles.

Most important spawning and nursery areas are in the Chesapeake Bay; some spawning also takes place in the Roanoke River, the upper part of Delaware Bay, and the lower Hudson River. Females usually mature when 4 years old or 20 inches long, males when 2 years old or 12 inches long. Spring and summer months are the spawning season.

Some of the striped bass spawned in the Chesapeake (biologists estimate about 10 percent) migrate out of the bay when they are about 2 years old and wander northward at least as far as New England. These fish make up the greater part of the supply available to fishermen in northern coastal states. The striped bass populations as a whole migrate extensively, northward in spring, south in autumn. Conservation of the supply, by appropriate size limits or other methods, therefore becomes an interstate problem.

THE WEAKFISH or GRAY SEA TROUT, one of the chief market fishes of the Middle Atlantic area, is also a favorite sport fish from Long Island to North Carolina. Pound net fisheries make most of the catch in the Chesapeake, center of the fishery; haul seines are used more extensively in North Carolina, where they are fished at night. Some purse seining is done in New Jersey. Anglers usually chum the weakfish with bait shrimp.

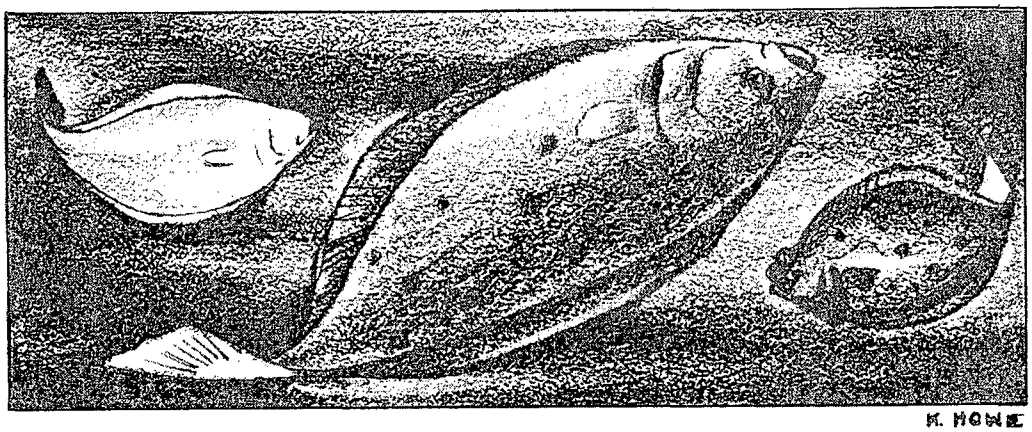
Weakfish is sold almost entirely in fresh fish markets, sometimes in the form of fresh fillets. Small amounts are frozen, salted, or smoked. This fish is available throughout the year, being taken inshore in summer and offshore by trawlers in winter.

Weakfish probably spawn in their third summer in the larger bays from Hatteras to Cape Cod, but most intensively in the Chesapeake. They migrate widely. Most of the fish spawned in the Long Island bays move at the end of their first summer to the Chesapeake or the sounds of North Carolina, remaining in southern waters about 2 years. In their third summer they migrate northward, but return each fall to the south. Likewise, southern-spawned weakfish tend to wander north in summer. Coastal runs are therefore composed of a mixture of fish from northern and southern spawning grounds. As a result of these migratory habits, the weakfish must be treated as an interstate unit if they are to be effectively conserved.

Seeming to prefer shallow water, schools of weakfish feed in the surf on open coasts and generally keep close inshore during the summer. They usually remain near the surface, feeding on smaller fish and on crabs, shrimps, squids, and other small marine creatures.

A related form, the spotted weakfish or spotted sea trout, is taken abundantly along with the gray trout in Chesapeake Bay.

SUMMER FLOUNDER



FLOUNDERS are among the most popular market fishes. Of the half dozen or more species that have commercial or recreational importance along the Atlantic coast, the summer flounder or fluke predominates in the Middle Atlantic area. This is one of the larger flounders, sometimes measuring 3 feet, weighing up to 25 pounds. Market sizes, however, range from ½ pound to 6 pounds. As dressed for market this species yields a larger fillet than most other flounders.

The summer flounder is found from Maine to northern Florida, but is most abundant from Long Island to North Carolina. On the coast as a whole, the resource yields about 11 million pounds of fish caught commercially, also supports an active sport fishery in the bays and inshore waters of Long Island, along the New Jersey coast, and in the lower Delaware Bay and adjacent seacoasts.

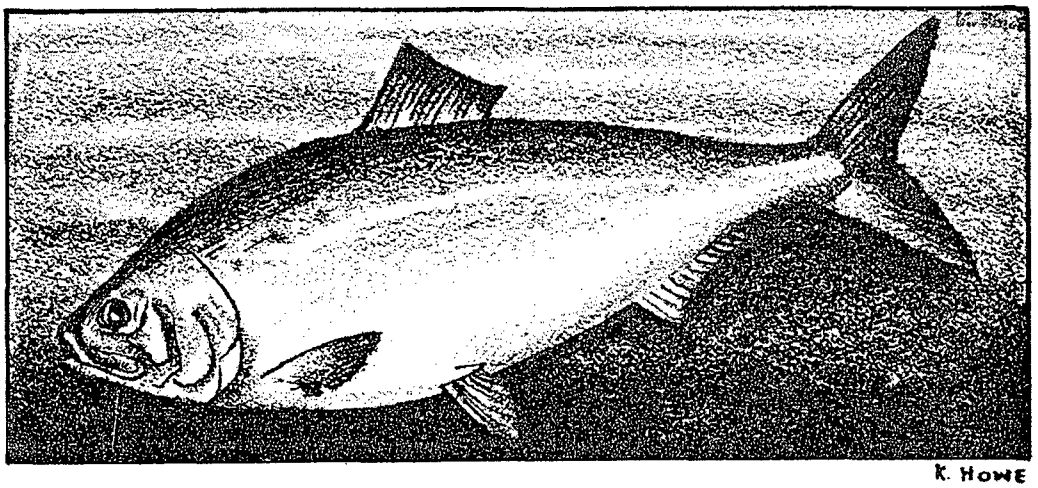
Most important summer fisheries for the summer flounder are located on the southern shore of Long Island and on the coasts of New Jersey and Delaware. In winter, the offshore catch extends from the offing of New York to Cape Hatteras, the summer flounder being the only flatfish taken in important quantities in the winter trawl fishery.

An active migrant, the summer flounder comes inshore in the spring, moves off in the fall. Its name arose from the fact that it is the most common flounder in the inshore coastal waters during the summer months. Most of the larger fish are believed to spend the summer in northern regions—northern New Jersey, southern Long Island, and southern New England; the smaller fish summer anywhere from southern New Jersey to the Virginia Capes. The older fish seem (on evidence from tagging experiments) to return to the same locality summer after summer.

These flounders spawn in the late fall or early winter, probably at sea. In the following spring the young move into coastal waters, where, like the adults, they live on or near the bottom. Probably spawning is more successful—that is, more young survive—from the Chesapeake south than in more northerly parts of the range.

Like other flatfish, the summer flounder is a predatory creature. It lives chiefly on other fishes, also eats shrimps, crabs, and other aquatic animals. Waiting for its prey, it lies partly buried in the sand, but darts up with surprising swiftness to seize a passing fish. In North Carolina, many are speared at night, by torchlight, as they lie on the bottom. Otter trawls, however are the most important gear used in the fishery.

Area catch in 1940:
6,800,000 pounds



K. HOWE

THE SHAD is one of the leading seafood delicacies of the Atlantic coast, where it enters streams from Nova Scotia to northern Florida to spawn in the spring. In the area from Cape Hatteras to Long Island, first shad runs of the season begin in February or March in North Carolina, in March in the Chesapeake Bay, usually in April along the New Jersey coast and in the Hudson River.

Once tremendously abundant all along the Atlantic coast, the shad resource has suffered from the effects of the white man's establishment along the banks of the coastal rivers. Dams, pollution, and excessive fishing have combined to deplete the runs. In the Chesapeake, present catches are about four million pounds annually, compared with some 16 million pounds half a century ago. On the Atlantic coast as a whole, the catch has declined from 50 million to 9 million pounds. Fortunately, much is now being learned about the biology of the shad as a basis for a sound program of restoration, and fishermen as well as State officials are showing an interest in rebuilding the resource. This has already been done in the Hudson River, where the runs have recovered from their low yield of 40,000 pounds in 1916 to 5 million pounds in 1944.

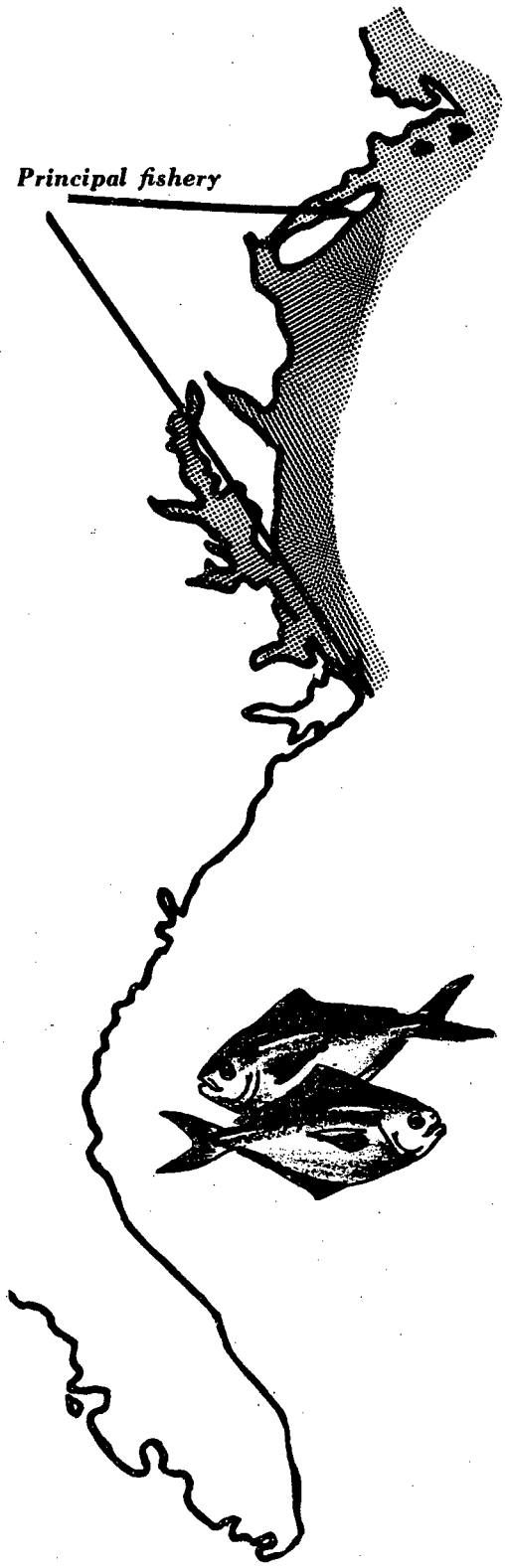
Shad have a peculiar life history. During the greater part of their existence they are inaccessible to the commercial fisheries. Spawned in rivers and streams, they migrate down to salt water as young fish scarcely as long as a man's finger. Little is known about their next two or three years. A few immature shad have been caught along the shores of Long Island, others off the coasts of Maine and Massachusetts, but the main populations of young shad have so far eluded fishermen's nets wherever they have been set.

Shad mature after several years of ocean life—three to four for males, four to as much as seven or eight for females. At maturity, they return to spawn in the rivers where they were hatched. In the course of this spawning migration, they are taken by commercial fishermen in bays, sounds, and rivers. Unlike the Pacific salmon, shad do not as a rule die after spawning but return to the sea from which they make repeated annual spawning migrations.

Fresh shad is available during only a limited season; frozen shad throughout the year. Some canning is done on the Pacific coast, where the shad was introduced in 1871. Frozen fillets of shad—a boneless product—have been prepared on an experimental basis, and may become an important market product after the war. Increasing quantities of fresh fillets are being marketed in the larger eastern cities.

Area catch in 1940:
8,045,000 lbs.

BUTTERFISH



THE BUTTERFISH is solely a commercial species. It is taken in winter as well as summer fisheries, hence is a popular market fish throughout the year. Summer fisheries are chiefly off Long Island and the New Jersey coast. In the fall, runs of large, fat butterfish appear off these coastal areas. These fish are in demand for smoking; the resulting product has a large market in New York delicatessens. Winter fishing for butterfish is carried on from the vicinity of offshore northern New Jersey south to Cape Hatteras, on the offshore grounds where trawlers operate. Most of the winter catch is made off northern New Jersey, along a deep undersea gully, leading to New York harbor.

Market sizes of butterfish in general range from a quarter of a pound to a pound and a half, placing it in the pan-fish category. Rich in fat, it is usually broiled or fried. Chief butterfish markets are Boston, New York, Philadelphia, Baltimore, and Norfolk.

While never seen in enormous schools like those of mackerel or herring, butterfish are rather gregarious, traveling in small, loosely organized bands. Their movements are inshore in summer, a spawning migration; offshore in winter.

Because of their habit of moving in toward the shore line in summer, they are easily taken in pound nets. On Long Island, more than 90 percent of the summer catch of butterfish is made by pounds. This fact creates an important conservation problem, for pound nets are not selective, but trap fish of all sizes. In an effort to return small butterfish to the sea unharmed, many fishermen are now using a sifter device which sorts out the small sizes as the pound is fished.

Butterfish spawn in June and July, and the young, which come to resemble the adults at an early age, are about 4 inches long by the end of their first summer. Small groups of fish less than one year old are often seen under the shelter of large jellyfish during the summer.

Area catch in 1940:
11,985,000 pounds

THE SPOT is a small pan fish, common in the Chesapeake Bay but taken in some numbers all along the coast within its range. Spot fisheries, centered in North Carolina and Virginia, take about 8 million pounds yearly. Because cities near the centers of production—Norfolk, Baltimore, and Richmond — consume almost the entire catch, the spot is not as well known to the general public as its quality merits.

Haul seines are the chief gear used in the spot fisheries, especially in Virginia and North Carolina. Probably the largest seines are operated in the vicinity of Ocean View, Virginia. The commercial catch generally consists of fish ranging from 6 to 12 inches long, weighing up to three-quarters of a pound. Spots are usually sold whole, being too small for filleting.

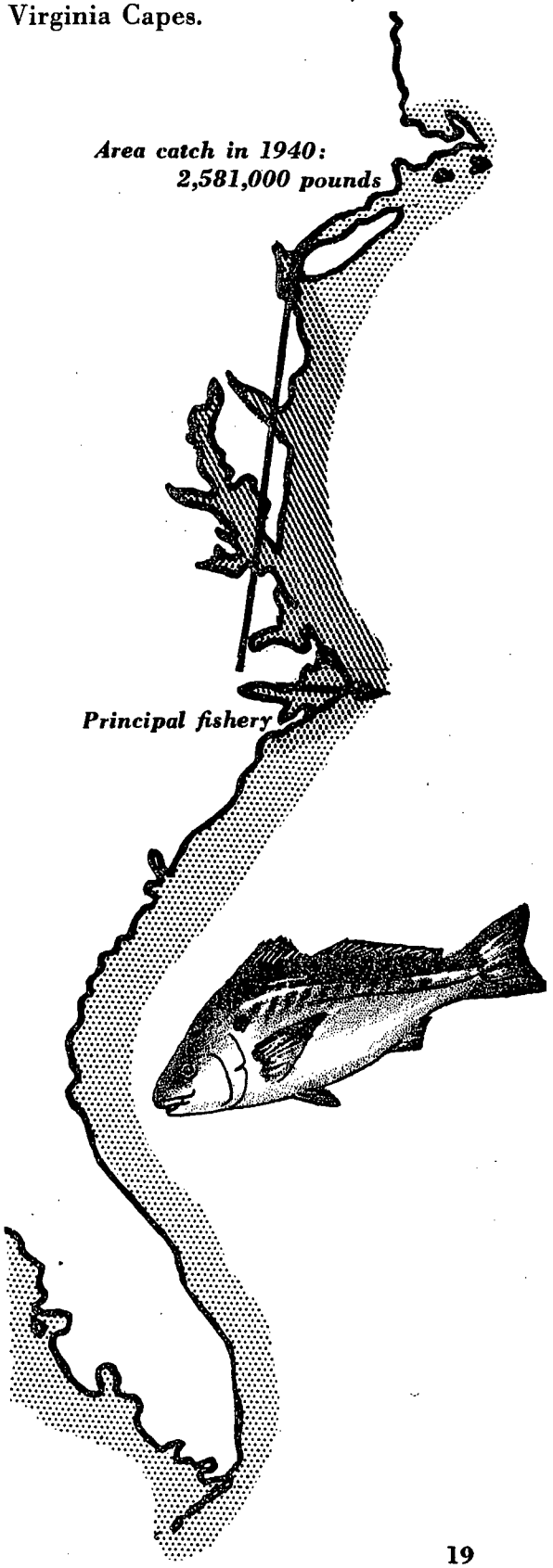
The spot belongs to the croaker family. Like its relatives, the croakers, drums, and sea trouts, it is able to drum on its air bladder. However, this organ is thin-walled and the drumming muscles are not well developed, hence the sound produced is a feeble imitation of the throbbing hum of the croakers.

The habits of spot are not completely known. They spawn in late fall and early winter, after they move out of the bays and sounds. Nursery grounds are probably close inshore, for young spot are abundant in Pamlico Sound and lower Chesapeake Bay.

Spots are very abundant some years, scarce in others. This suggests that there are great variations in the survival of the young from year to year, probably depending on environmental conditions.

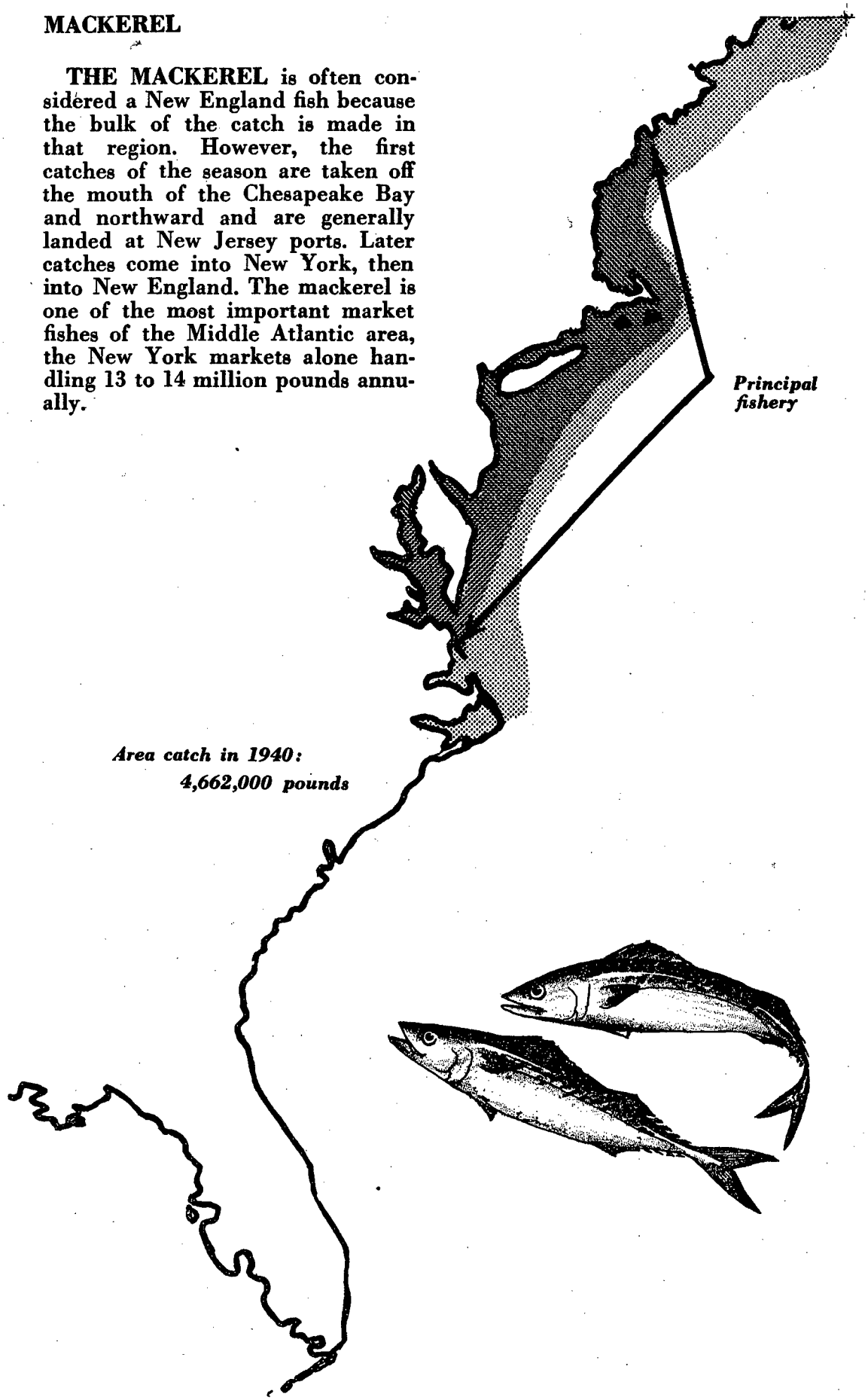
Seasons of greatest market abundance are spring and fall, when the fish are moving to and from the bays and sounds. In the fall, the movements of the spot seem to concentrate them in heavier runs, hence the fall fisheries are more active and larger catches are made then.

The winter habitat of the spot is unknown, but presumably is in deep water offshore. A few are taken in the winter trawl fisheries, off the Virginia Capes.



MACKEREL

THE MACKEREL is often considered a New England fish because the bulk of the catch is made in that region. However, the first catches of the season are taken off the mouth of the Chesapeake Bay and northward and are generally landed at New Jersey ports. Later catches come into New York, then into New England. The mackerel is one of the most important market fishes of the Middle Atlantic area, the New York markets alone handling 13 to 14 million pounds annually.



Mackerel are highly migratory, their movements difficult to predict. Their seasonal migrations control the operations of the fishery, and their extreme changes in abundance from year to year set in motion a chain of economic effects, making the mackerel industry one of the most precarious ventures among the fisheries.

Every spring the mackerel migrate from the deeper waters off the coast, where they have wintered, and move shoreward in two vast divisions: one that arrives off the Chesapeake and Delaware Bays in April, another that comes inshore in the vicinity of southern New England in late May. Both groups then move in a northeasterly direction up the coast. This shoreward movement is a spawning migration. After spawning, the mackerel spend the summer feeding on the abundant surface life of the coastal waters. The southern group of mackerel summers in the Gulf of Maine, the northern in the Gulf of St. Lawrence.

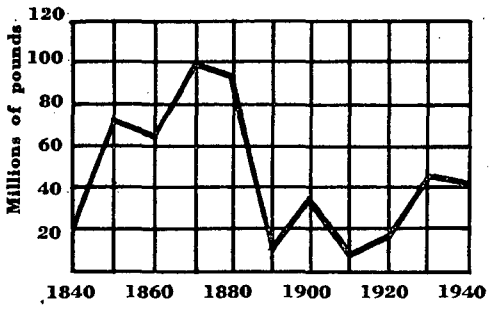
Oceanic conditions — water temperatures, distribution of feed, perhaps other factors—appear to control the movements and concentrations of mackerel. In some years the fish do not appear on their usual feeding grounds, or are widely scattered, making it difficult for fishermen to locate them.

Years of poor mackerel catches, however, usually reflect an actual scarcity. More than most fish, at least among the species that are well known, young mackerel seem to be affected by environmental conditions, attacks by natural enemies, availability of food. What happened in one year, when infant mortality must have been unusually high, serves to illustrate the point. In 1932, out of every million mackerel eggs spawned, only four young fish survived the first 2 months. This almost complete failure of the year's spawning had its inevitable result in poor catches by fishermen a few years later. However, when conditions favor survival and growth of the young mackerel, broods of enormous size may result, and subsequent catches are good.

While the conditions that determine the abundance of mackerel are of a cosmic character, and as such uncontrollable, it is possible that with further study the environmental factors may be foreseen and their effects well enough understood to allow biologists to make accurate predictions of the abundance of mackerel in advance of the fishing season.

Mackerel are taken largely in purse seines. There is also a small gill net fishery, and some are taken in pound nets. Most seining is done at night, the fish being located by the phosphorescent glow which their movements create in the water.

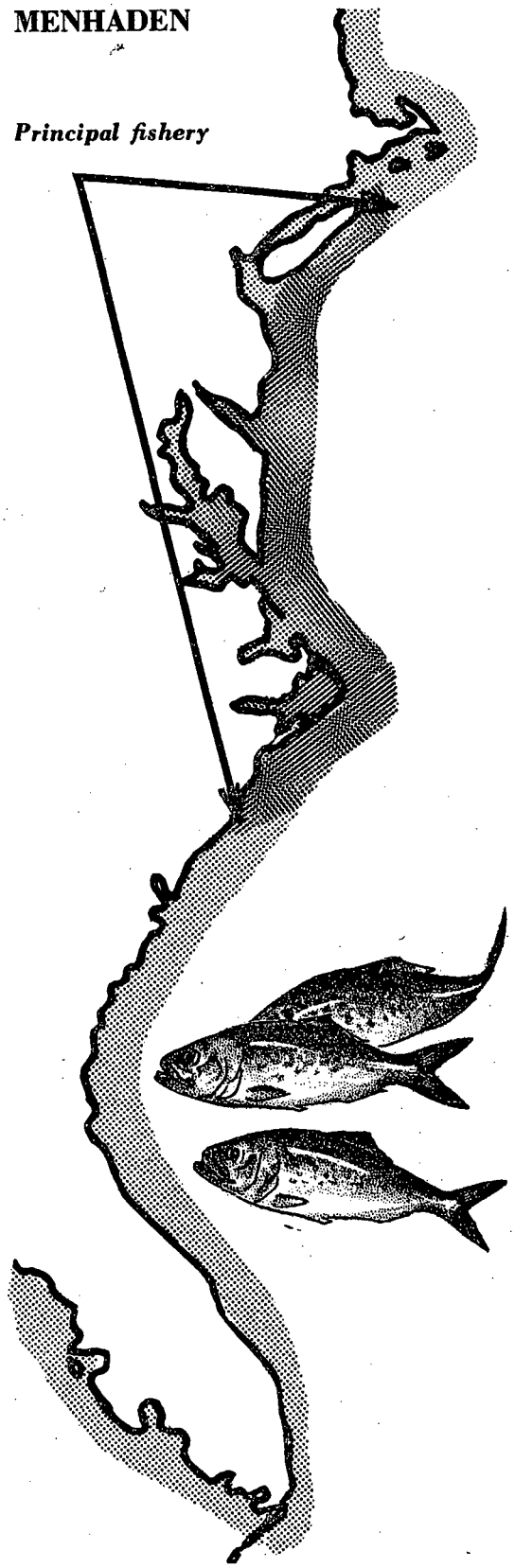
Mackerel are caught from late March or early April into December (rarely into January) and thus are available in the fresh state during the greater part of the year. A considerable part of the catch is frozen. Although the early mackerel fishery was a salt-fish industry, today only a small part of the catch—about 6 million pounds—is salted or smoked. Smaller quantities are filleted. During the war a considerable amount of mackerel has been canned; normally, however, less than 2 million pounds are so treated.



During the history of the mackerel fishery, the catch has shown extreme fluctuations, from only a few million pounds to 100 million or more.

MENHADEN

Principal fishery



THE MENHADEN at present has little utility as a food fish; its importance rests on the fact that it supports the largest fishery byproduct industry on the Atlantic coast and ranks second in volume of production among all fisheries of the United States.

A third of the fish meals and a fourth of the marine animal oils produced in the United States are derived from the menhaden. The meals are fed to hogs and poultry; the oils are used in preparing fortified vitamin feeding oils for poultry. Industrial uses of menhaden oil are many: as a constituent of many paints, varnishes, insect sprays, printing inks, and soap; as a lubricant for machinery; in aluminum casting; in leather tanning. Small quantities of menhaden are canned, and the roe is saved for freezing, salting, or canning.

Menhaden, of which at least three species occur on the Atlantic coast, are herringlike fish that swim in enormous schools near the surface of the water, straining out the minute forms of sea life. They form perhaps one of the chief foods of the larger predatory fishes present in the same area.

Menhaden mature during their third or fourth year, spawn in the summer and fall. They increase in oil content, and therefore in commercial value, with age and size. Also, northern menhaden are more oily than southern.

The fishery is largely controlled by the seasonal migrations of the menhaden. In the spring large schools appear in the coastal waters, entering bays, sounds, and river mouths. Fishing begins in northern New Jersey and western Long Island in early June, a little later in the Chesapeake Bay where intensive activity continues into October or November, when the fish move out of the Bay and down the coast into the region of the North Carolina fall fisheries. The purse seine is the most important gear used in the menhaden fishery.

Area catch in 1940: 388,596,000 lbs.

RIVER HERRING support one of the principal river fisheries of the Atlantic coast. They are caught in greater quantity than any other food fish in North Carolina, outrank all other aquatic products except crabs and oysters in Maryland, and are one of the chief products of the Virginia fisheries. Elsewhere in the Middle Atlantic area few are caught, but in New England, where they are called alewives, rather large fisheries exist.

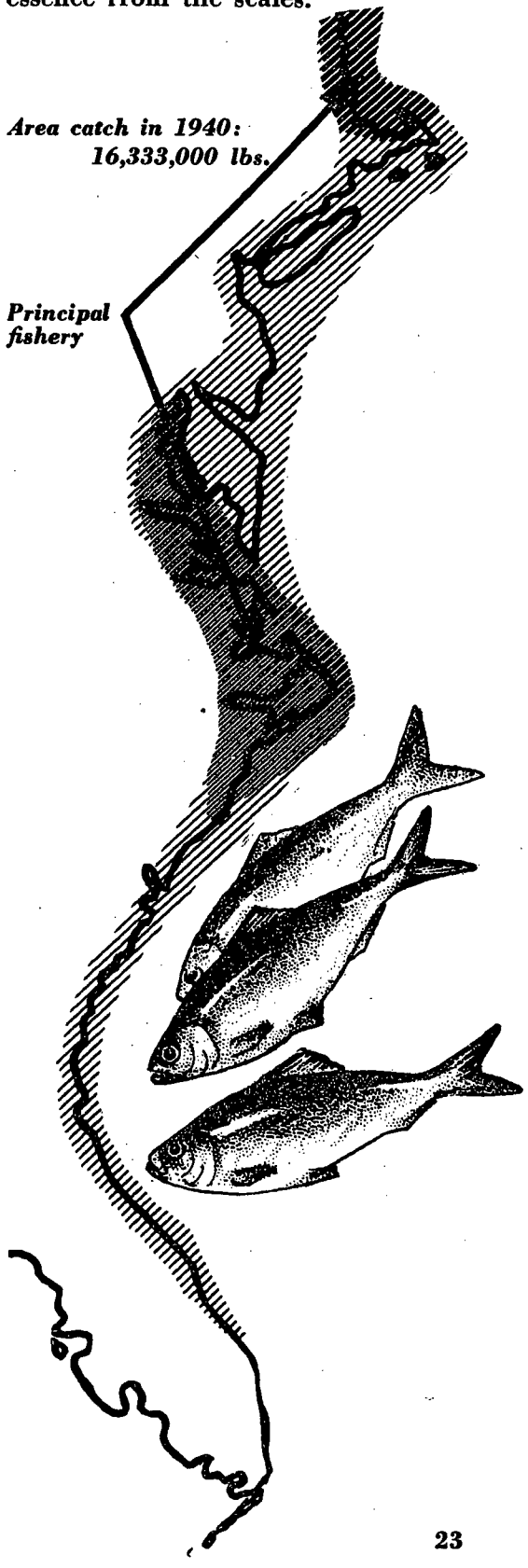
River herring enter the coastal rivers in the spring, often in company with shad, and return to the ocean after spawning. Pound nets in Albemarle Sound, Chesapeake Bay, and the lower stretches of the tributary rivers catch large quantities during this migration.

The river herring fisheries are supported by two species whose ranges overlap: the "true" alewife or branch herring (Nova Scotia to the Carolinas) and the blueback (Bay of Fundy to Florida).

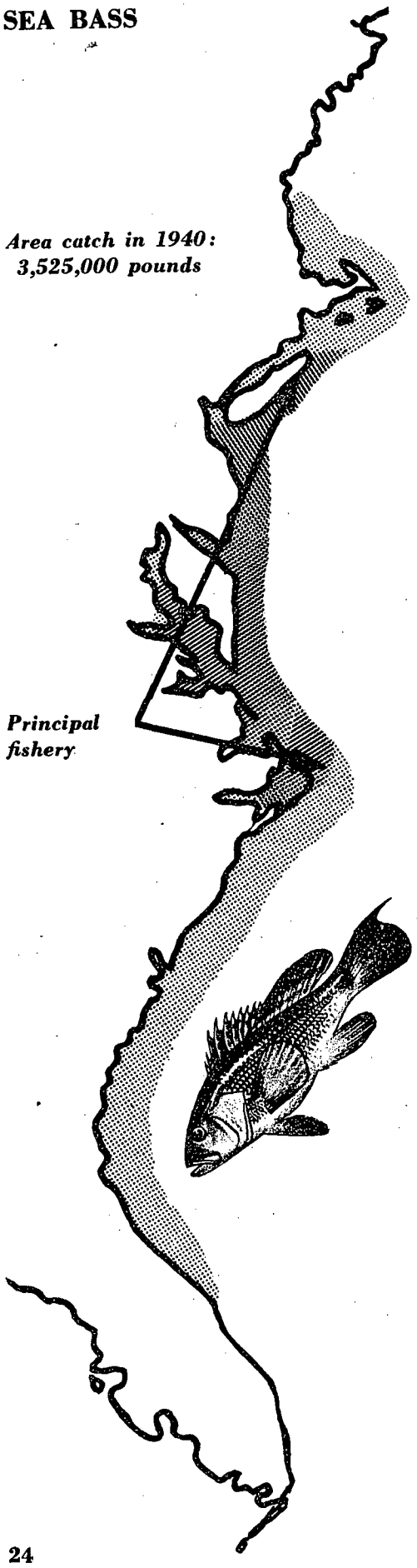
The fish usually enter the streams in tremendous numbers, move upstream to the spawning grounds by day, and return to the sea immediately after spawning. The young hatch in 2 to 6 days, depending on the temperature, develop rapidly, and in the fall descend to the ocean as 2- to 4-inch fish.

The ocean life of the river herring is not well known. They are schooling, gregarious fish, wandering near the surface of the sea in summer and autumn and feeding on the minute life of the waters. In their turn, they serve as food for many of the larger, predacious fishes. Probably they winter in deep water, off the rivers of their origin.

Little of the catch is eaten fresh. The canning of river herring and their roe is one of the principal seafood canning industries of the Atlantic coast from Maryland to North Carolina. Much of the catch is salted or cured in vinegar and salt for use in making special herring products. A few are smoked. Byproducts of the industry are dry scrap for fertilizer, oil, and pearl essence from the scales.



SEA BASS



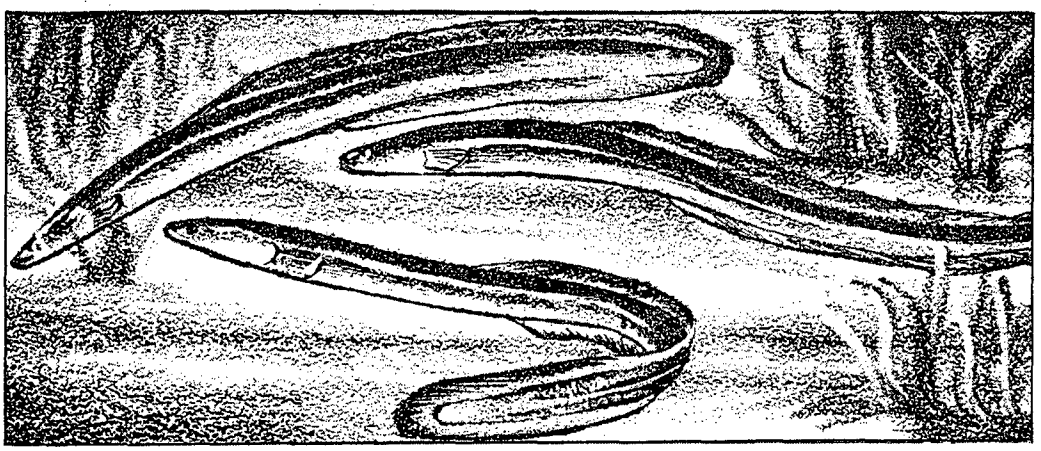
THE SEA BASS supports large sport fisheries and is also a popular market fish in the Middle Atlantic area. Center of the commercial fishery is the coast of New Jersey, which yields about 2½ million pounds, and the winter trawl fishery off the New Jersey and Virginia capes, where 3 to 4 million pounds are taken each year.

The sea bass, best known member of a large group of bottom-living, marine fishes, lurks around wrecks and wharf pilings, frequents rocky bottoms which snag fishermen's trawl nets. As a result, one of the most effective kinds of sea bass gear, especially in New Jersey, is the fish pot—much like a lobster pot with the height of the funnel increased to admit the fish. The pots are set unbaited on rough bottom, buoy lines marking their location. One fisherman sets up to 650 pots. Hazards of the pot fishery are many: passing boats may cut or foul the lines, storms carry away the pots. Hand lining, another good method of fishing on rough bottom, is common on the rocky shoals off Montauk Point, also in the North Carolina fishery. Sea bass are taken by dragging off Long Island and New Jersey in summer.

These fish move inshore and probably northward in spring, offshore and probably south in autumn. Sport and commercial fisheries for sea bass open up in May along the New Jersey coast, continue until about November.

Adult sea bass live chiefly on other creatures of the sea bottom: mussels, crabs, small lobsters, some fish, a few plants. The young eat smaller fare, mostly minute crustacea. Sea bass spawn in May and June in coastal waters.

Market sizes range from half a pound to about four pounds. Sea bass usually are sold whole, but sometimes are steaked or filleted.



THE EEL has an extraordinary history. All the eels of the Atlantic Ocean—both the European and the American eels—are born in the deep Atlantic, south of Bermuda. After hatching as minute, transparent larvae, the young eels gradually rise out of the deep, warm water to the upper layers of the ocean. There they begin a long migration which carries them to the shores from which their parents came. Remarkably, young European eels always return to Europe, young American eels to America, although the two species of larvae are mingled to some extent on the spawning grounds.

American eels reach our shores in the spring when somewhat more than a year old. They enter the bays and sounds and ascend the streams in enormous numbers. At this stage they are still transparent with only traces of pigment appearing on their glassy, rodlike bodies. The males are believed to remain in brackish water, while the females ascend the streams, sometimes to distant headwaters.

The males grow to a length of about 2 feet, females to 3 or 4. Some of the eels are believed to mature at the age of 7 or 8 years, others not until they are 12 or even older. The spawning migration of the mature eels takes place in the fall, the females descending the rivers, joining the males in the estuaries and bays, and in company with them returning to the oceanic spawning grounds. Presumably they die after this single spawning.

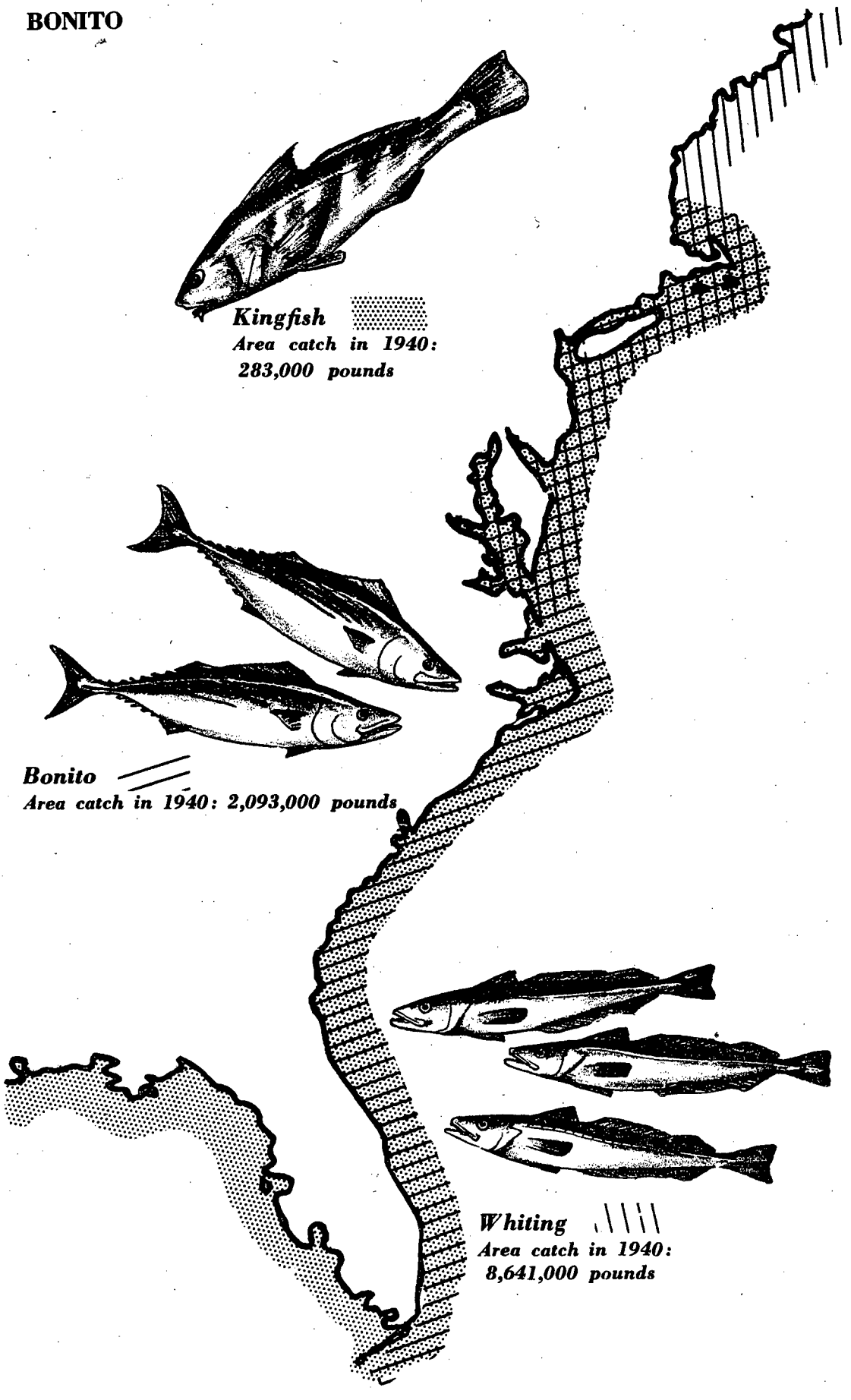
American eels are confined to the Atlantic and Gulf coasts and the streams which descend to them. Eel fisheries in the United States are carried on from Maine to Florida (small catches are made also in Lake Ontario and the Mississippi Valley), but are concentrated in the Middle Atlantic area. New York and New Jersey provide the largest catches.

The fisheries continue throughout the year but are most active in the late fall, when eels are sought for the Christmas market. The Italian populations of the larger cities—especially New York and Philadelphia—use eels in preparing the principal dish for the Christmas Eve supper. To supply this demand, eels are shipped in tank trucks from North Carolina, Virginia, and other areas, and a special shipment of live eels is made by barge down the St. Lawrence River, Lake Champlain, and the Hudson River.

Although the market for live eels is largely confined to the holiday season, smoked eels are sold throughout the year.

Area catch in 1940:
782,000 pounds

BONITO


Kingfish
Area catch in 1940:
283,000 pounds
Bonito
Area catch in 1940: 2,093,000 pounds
Whiting
Area catch in 1940:
8,641,000 pounds

THE BONITO, a member of the mackerel tribe, inhabits the warmer parts of all the great oceans of the world—the Atlantic, the Pacific, and the Indian. Chiefly an oceanic fish, it comes inshore in pursuit of the mackerel, menhaden, squid or other fish on which it lives. Like most of its relatives it travels in schools, swims rapidly, and feeds for the most part at the surface.

A large pound net fishery for bonito is operated in New Jersey, taking nearly a million and a half pounds annually. Only small catches, ranging from a few thousand to half a million pounds, are made in other Middle Atlantic states. About a hundred thousand pounds are taken in New England, none south of North Carolina.

Very little is known about the migrations of the bonito, or its spawning habits. It is common from Massachusetts to Florida. Apparently it makes some coastwise migrations, but their extent or purpose has not been discovered. It seldom enters enclosed waters like the Chesapeake in any numbers.

Bonito run from 2 to 15 pounds in weight. They are usually cut in thick steaks.

Its strength and size make the bonito a favorite game fish, which anglers take by trolling.

THE WHITING or SILVER HAKE, a fish closely related to the cods, supports important fisheries in New York and New Jersey and is also taken in small quantities off Maryland and Virginia. Off Long Island, it is common throughout most of the year, being caught offshore by otter trawlers from November through March, inshore by pound netters in spring and fall. In deep, offshore waters, whiting range as far south as Tortugas; inshore, are seldom found south of Virginia.

Large runs of whiting appear off Long Island and New Jersey in the spring and fall. The fall run is a mixture of large fish and small or "pencil" whiting. Whether this seasonal schooling is associated with a spawning migration is not known. Whiting do, however, spawn from June until September. The eggs and young drift in the currents; the fry later descend to the bottom when about an inch long. Adult whiting often live on the bottom, but also roam through all levels of the sea, for they are active predators. They feed usually on schooling fish, or on squids, crabs, and crustaceans.

Chief markets for the whiting caught in the Middle Atlantic area are New York, Philadelphia, and Pittsburgh. Most whiting caught in New England and some frozen whiting from New Jersey is shipped to the Middle West, especially Kansas City, where it is used in fried fish sandwiches.

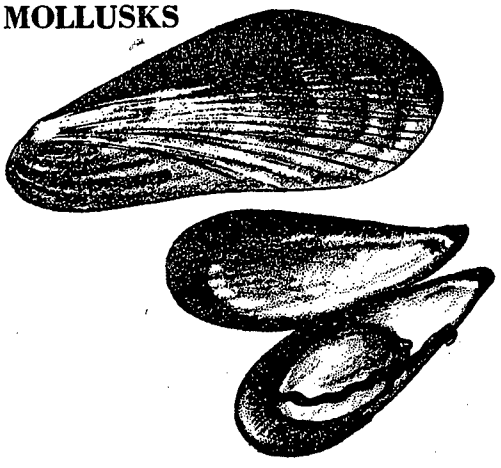
THE KINGFISHES, also called ground mullet, king whiting, sea mullet, or sea mink are members of the croaker family and should not be confused with the "kingfish" of the mackerel tribe. Three species, with interlapping ranges, are found along the Middle Atlantic coast.

From New York to North Carolina, kingfish are taken mainly in haul seines, gill nets, and pound nets, largest catches being made in Virginia and North Carolina. They are chiefly summer fish, those available in the winter being shipped in from the south.

Kingfish live on the bottom, tend to move inshore in summer and offshore in winter. In the summer they ascend the Chesapeake about to the mouth of the Patuxent. They are believed to mature at the age of three years. They spawn from June to August, chiefly along the ocean shores, but sometimes in inside waters.

Chief markets for kingfish are the large cities of the Middle Atlantic area, where they command a good price and are considered among the choicer varieties.

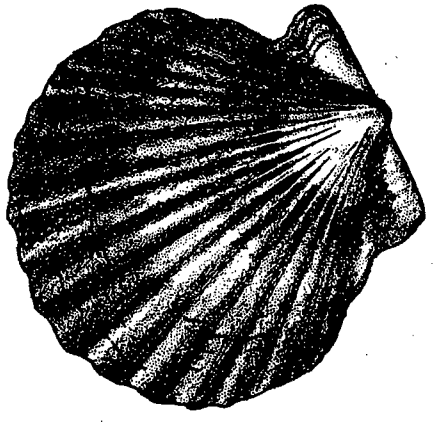
MOLLUSKS



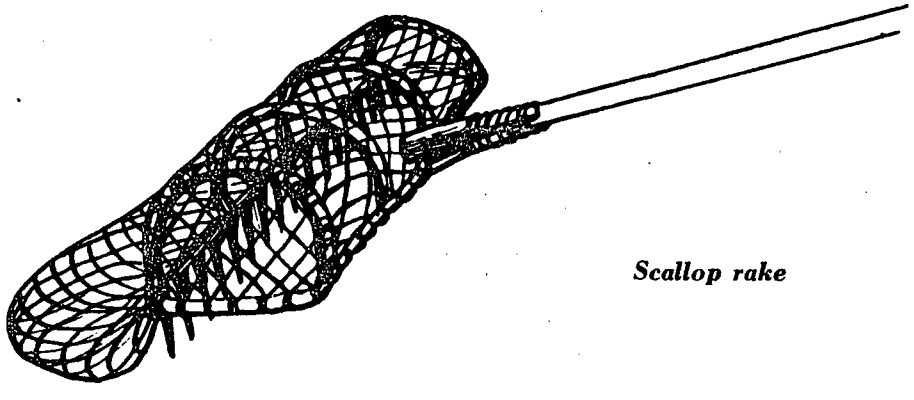
THE RIBBED MUSSEL supports one of the newest and most unusual aquatic industries of the Middle Atlantic region, supplying "provitamin D," which, on irradiation with ultraviolet light becomes transformed into vitamin D and is used in poultry feeding. Prior to 1940, United States needs for this product were supplied by the mussel fishery of Holland. When war cut off this foreign supply, chemists discovered a domestic source in the ribbed mussel, found from Nova Scotia to Georgia. An industry was developed on the ocean side of Virginia's Eastern Shore peninsula, soon becoming the country's principal source of provitamin D. Although large mussel beds are believed to exist in the Carolinas, only the Virginia resource has, up to now, been tapped. Little is known about the extent of the resource or the natural replacement rate of the mussels.

A small fishery for the related sea mussel is carried on in the Oyster Bay region of Long Island. These mussels are a food resource, as yet little utilized.

SCALLOPS taken along the Middle Atlantic coast are of two kinds: sea scallops and bay scallops. Production of sea scallops in the waters of this area is small, but about two million pounds, chiefly taken in New England, are landed at its ports. Small but intensive fisheries for the bay scallop exist in Rhode Island, Long Island, and North Carolina. Virginia formerly produced several million pounds of bay scallops and New Jersey a smaller amount. However, the scallop fisheries in these and many other areas disappeared early in the 1930's simultaneously with the destruction, by a mysterious disease, of the eel grass in which the young scallops shelter. The only portion of the scallop—either bay



or sea—that is eaten is the large muscle that controls the movements of the shells. Sea scallops are taken by dredging, sometimes at considerable depths; bay scallops in shallow water by dredges, rakes, or dip nets.

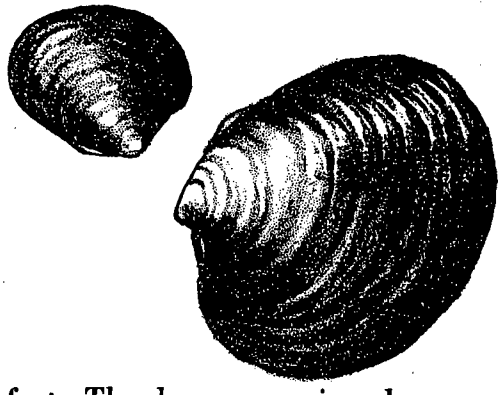


Scallop rake

THE HARD SHELL CLAM (quahog, round clam, little neck) is the most abundant clam on Middle Atlantic shores. The fisheries of New York and New Jersey yield between 2 and 3 million pounds each; the Virginia clam industry is only slightly less productive, with a yield of nearly 2 million pounds. Small quantities are taken in Delaware, Maryland, and North Carolina.

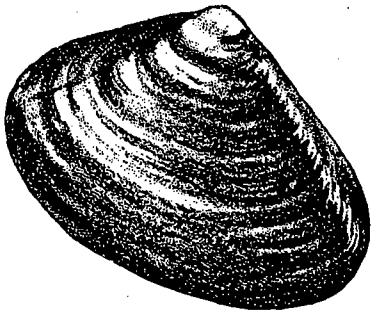
The bulk of the clam catch is sold fresh; the balance is canned—as minced clams, as chowder, or as clam cocktail.

Hard shell clams live in coastal waters, from almost the high tide level to depths of more than 50



feet. The deeper growing clams are taken by dredging or with tongs (the New York fishery is carried on entirely by tonging), while clams that live in or near the tidal zone are dug out of the sand with rakes or are picked by hand.

Because hard shell clams are well adapted to cultivation and grow within a wide depth range, the fishery could be greatly developed by extensive farming. In practice, however, cultivation has been neglected and pollution has been tolerated in otherwise good clam-growing areas; as a result only a fraction of the potential value of the clam resource is realized.



THE SURF CLAM, one of the commonest shellfish of the Middle Atlantic coast, has supported an important fishery only during the past two years, when a new industry was developed to supply wartime needs for canned products. Principal commercial operations are now carried on along the southern shore of Long Island, where the clams are taken in dredges a half mile to a mile from shore. Some are sold fresh, part are canned locally, but most are shipped to Maine for canning. With about 25 boats fishing for surf clams in 1945, average daily production was reported as about 2,000 bushels. Almost the entire production goes to the military services. The clams live on exposed coasts from Labrador to Cape Hatteras, burying themselves in the bottom to a depth of several inches. They spawn in the spring and throughout the summer. About 5 years are required to reach a length of 4½ inches.

APPENDIX

Nutritive Value of Fish and Shellfish: Fish are good natural sources of calcium, phosphorus, iron, and copper and provide protein of unexcelled quality. Some species also furnish vitamins in appreciable quantities and sea fish are rich in iodine.

Fish are an important source of proteins, a type of food which must be included in the diet to provide the elements needed to grow and repair worn-out body tissues. Some proteins are complete in that they supply all of the elements needed; others are incomplete and must be supplemented with other protein foods if the body is to remain in normal health. Fish proteins, like those in beef, pork, and other meats, are complete in themselves and proteins of this type should supply about one-third of the daily protein requirement.

Fish are an excellent source of most of the minerals which the body needs to develop properly and perform its functions. Calcium and phosphorus (without which proper development of bones and teeth is impossible) occur in fish fillets in about the same quantities as in beef round. Marine fishes are especially rich sources of iodine, containing 50 to 200 times as much of this essential element as any other food. Oysters, shrimp, and crabmeat, compared with milk, provide half as much calcium, five times as much magnesium, and slightly more phosphorus. Iron and copper, which build up the hemoglobin content of the blood and prevent or remedy nutritional anemia, are easily obtained by eating most fish. Oysters and shrimp are the best known sources of these two minerals.

Although fish-liver oils have long been recognized as first-class sources of vitamins A and D, it is less widely known that the flesh of fish is also a source of several vitamins. On the average, daily vitamin requirements could be obtained from ordinary serving portions of fish to the following extent: vitamin A, 10 percent; vitamin D, more than adequate amounts; thiamin (vitamin B_1), 15 percent; riboflavin (vitamin B_2), and nicotinic acid (another element of the vitamin B complex), 70 percent.

General Guides for Selecting and Preparing Fish: Insist upon freshness. A fresh fish may be recognized by the following: firm and elastic flesh, scales that cling to the skin in most species, reddish gills free from disagreeable odor, eyes bright and full, not sunken. In selecting shellfish like clams and oysters, be sure that the shells are tightly shut, indicating that the animals are alive, unless you prefer to buy the meat separately as shucked shellfish. Crabs and lobsters should be bought alive or as cooked meat. However, uncooked shrimp may be bought in the shell provided it feels firm to the touch. Cooked shrimp is sold either with or without the shell, with the heads already removed.

When to buy: In general, the fish of any species are of highest food quality when most abundant, for at these periods fishermen are making their catches in the shortest time and shipping them promptly. Usually, but not always, fish are cheapest when most abundant.

Common market forms: Fresh (refrigerated) fish and completely frozen fish should be equally good if the freezing is done by the modern methods now well known to the industry. Both are marketed in a variety of convenient forms, as follows:

Whole or round fish are those marketed in the form in which they come from the water, and are of three kinds: fish that keep as well or better without dressing, small fishes, or the small sizes of larger species. Before cooking, whole or round fish are eviscerated and in all but the very small sizes, the heads, scales, and sometimes the fins are removed.

Drawn fish are those marketed with only the entrails removed. To prepare these fish for cooking the heads, scales, and (if desired) the fins are removed, and the fish may be split or cut into serving portions if too large to be cooked whole.

Dressed fish have had the head and entrails removed and the tail and fins may be cut off. If dressed fish are large they may be cut into pieces in preparation for cooking. Very large dressed fish are sometimes marketed in pieces.

Steaks are slices (usually about half an inch thick) cut across a large dressed fish.

Fillets are meaty slices cut lengthwise from the sides of the fish. Fillets contain no bones or other waste. Their weight varies with the size of the fish from which they are cut.

Sticks are crosswise or lengthwise cuts of fillets.

Canned fish: Besides the universally familiar canned salmon, tuna, and sardines, many kinds of fish are canned for use in main dishes, salads, and appetizers.

Salt or Smoked fish: Tasty variations in the menu are provided by salt or smoked fish. Salt fish ordinarily requires one-half to several hours' soaking before further preparation; while smoked fish usually is ready to eat as it is or may be heated.

Fat content of fish: For best results in preparing a fresh fish, it is always desirable to know whether it is fat or lean. Fat fish are especially suitable for baking, and may also be broiled, while lean fish are best adapted to steaming, boiling, and frying. Medium-fat fish are prepared like the lean, or may be dressed with strips of salt pork or bacon and baked. Most cook books classify fish as follows:

Fat fish are those containing more than 5 percent fat. Examples are shad, mackerel, eel, butterfish, herring, porgies, striped bass.

Lean fish are those containing less than 5 percent fat. Examples are croaker, sea bass, weakfish, oysters, crabs, flounders, spot, whiting, clams.

Sauces and garnishes: The attractiveness of almost any dish consisting of fish will be increased greatly by the use of sauces that subtly enhance or complement the flavor. Any good cook book contains excellent suggestions as to the choice and preparation of such sauces.[2] Fresh and colorful garnishes also do much to create a dish as pleasing to the eye as to the palate, thereby whetting the appetite and helping to make the serving of fish a pleasurable and often repeated experience.

[2] Sauces for seafoods. Fishery Leaflet 53. Mimeographed, 4 pages, may be obtained on request from the Fish and Wildlife Service, Chicago 54, Ill.

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