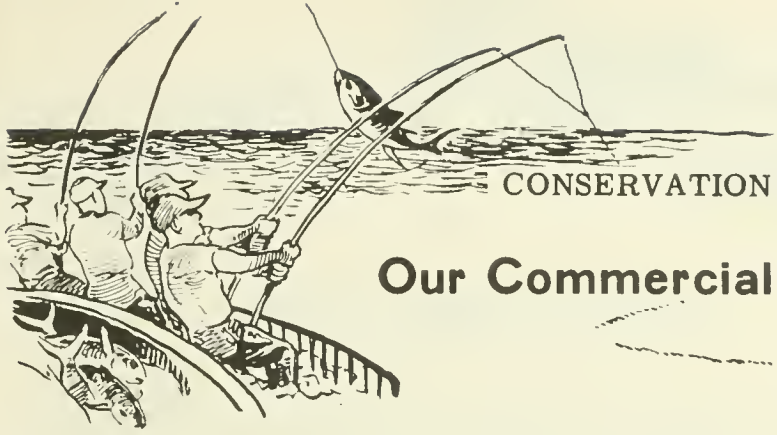


CONSERVATION NOTES

Our Commercial Fisheries

A fish is a cold-blooded, aquatic animal with fins, permanent gills (used for breathing in water), a backbone, and a skull. A shellfish is an aquatic animal with a shell, but it lacks fins, skull, and vertebrae.

American shad

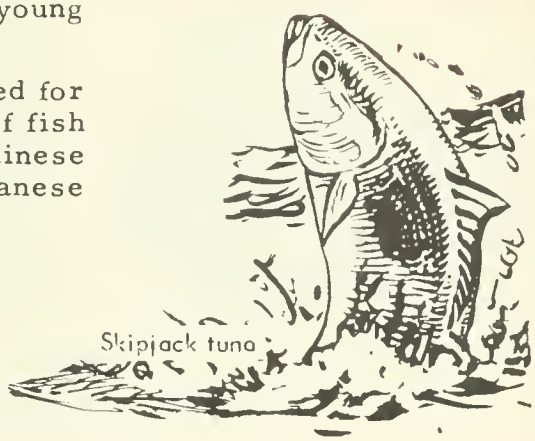
Some fishing terms.--Fish are "commercial" when they are caught for the market; "sport" when they are caught for fun; and "rough" when they appear in abundance where not wanted. For example, a carp is a commercial fish in some areas where it is an article of food; a sport fish in some places where the usual sport fish are scarce; and a rough fish in many lakes and streams where it is crowding out trout and bass or other more desirable sport fish. Salmon, shad, and striped bass are commercial fish to some people and sport fish to others.

Blue crab

Fish can be classified as anadromous, catadromous, salt-water, or fresh-water. Anadromous species--salmon, alewives, striped bass, shad, steelhead trout--are hatched in fresh-water lakes or streams but mature in salt water and come back to fresh water to spawn, and some, like salmon, die after spawning. Catadromous species--like the American eel--live in fresh water and go to sea to spawn. Some fish, like halibut, tuna, and cod, spend their entire lives in the sea; others, like pike, smallmouth bass, and some trout, live only in fresh water.

Fish are also classified as food fish and industrial fish. Sometimes industrial fish become human food indirectly. Meal made from industrial fish is used in poultry feed and certain byproducts, or "solubles," are fed to young pigs.

About 200 species of fish and shellfish are used for food. American fishermen harvest 5 billion pounds of fish each year, about the same as do Russian and Chinese fishermen, but slightly less than half the catch of Japanese fishermen.

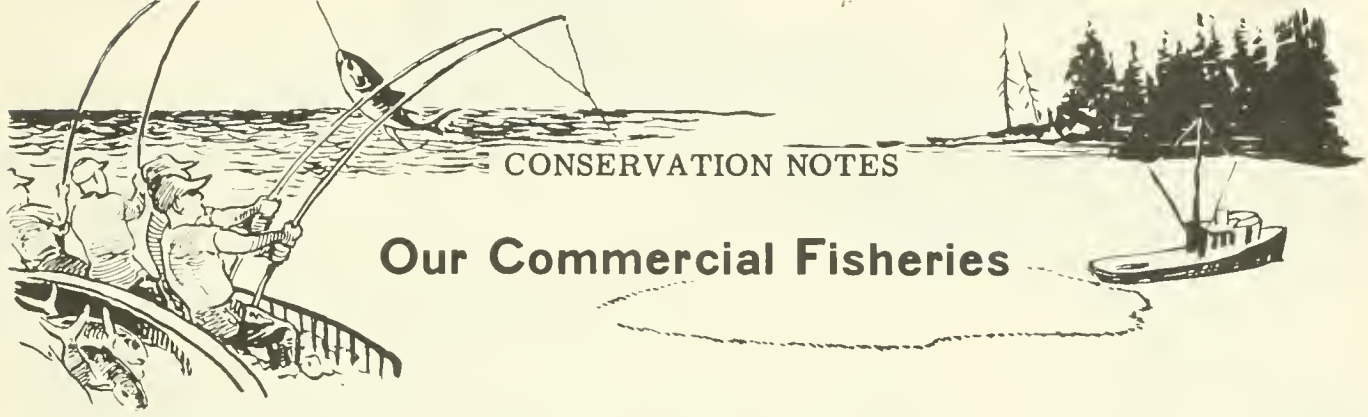


Skipjack tuna

UNITED STATES DEPARTMENT OF THE INTERIOR

Stewart L. Udall, *Secretary*

FISH AND WILDLIFE SERVICE



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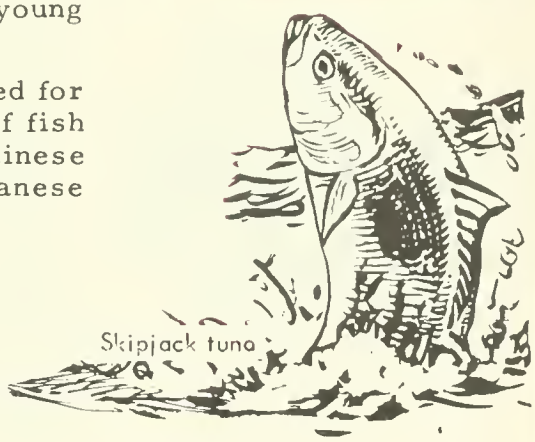

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FISH AND WILDLIFE SERVICE

Fish ladders are series of pools that lead the migrating fish over high dams

What Man Must Know

Men have been fishing for thousands of years but know comparatively little about fish and what affects their abundance and movements. "Sea culture" is a new science and the restlessness of the ocean complicates our efforts to unlock its secrets.

The supply of fish in the ocean is not inexhaustible and Man must practice conservation in the sea just as he is beginning to practice conservation on the land.

When, where, and how many.--A most important fact the fishery conservationist must learn is the "maximum sustainable yield" of each species--that is, the greatest number that can be harvested each year and leave enough for harvesting the next year and the next. The conservationist must also predict when and where the fish are available; and know that they are available to the fisherman. The fishermen can then prepare for big harvests or small, as conditions warrant. "Predicting abundance" is a step in conservation because it permits a regulated harvesting and ensures protection of the available fish.

The flat-bodied halibut spends most of its life buried in the sand on the ocean floor

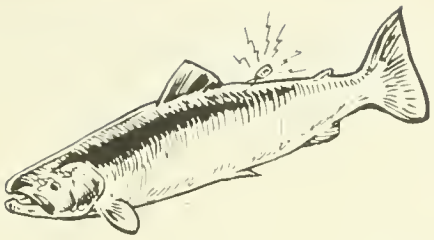
How, how, and how.--But knowing "when, where, and how many" is only part of the work of the fishery conservationist. He must be able to tell the fishing industry how to make the best possible catch without damage to the resource; how to get the product to the family table with minimum loss of fish or quality; and how to make the best industrial use of fish not presently used for human food.

The brilliantly colored tilefish lives in northern waters although it belongs to a tropical family

Intriguing mysteries.--Solving these mysteries include finding the reason why a species such as the tilefish suddenly disappears from its haunts and is missing for years to reappear suddenly in great numbers; the reason for heavy mortality of a species when known conditions appear normal; the "spark" which causes the "red tide" organism to suddenly increase in numbers, killing millions of fish.

Some recognized dangers.--Predators, such as squawfish awaiting young salmon at a river mouth; starfish and drills ruining an oyster harvest; green crabs killing clams; sea lamprey attacking Great Lakes trout fisheries, must be controlled. Obstructions, as dams blocking fish runs; irrigation outlets and power turbine intakes diverting fish from their course, must be bypassed. Silt that covers spawning grounds and shellfish beds or ruins growth of aquatic plants by making the water too murky for sunlight to penetrate; water fluctuations that drown out or dry up spawning areas; domestic and industrial pollution; careless use of pesticides, all pose problems of great concern to the conservationist.

Salmon on their nest



Biologists are learning more about the effects of high dams on migrating fish from the "beeps" given off by sonic tags fastened to the fishes' backs

Electric shockers are used to stun fish so that they can be caught, studied, and set free unharmed

Getting the Facts

Government agencies, colleges, and private institutions are engaged in collecting information about the fisheries. The U. S. Bureau of Commercial Fisheries is the agency responsible for the Federal Government's part of this work. Getting these facts requires the services of biologists, chemists, civil, mechanical, and electronic engineers, oceanographers, market specialists, refrigeration specialists, food inspectors, statisticians, economists, trade specialists, linguists, translators, airplane pilots, vessel operators, divers, home economists, law-enforcement personnel, and numerous types of researchers and skilled workers.

Life history.--One of the first things a biologist wants to learn about a species is its life history: when and where it spawns; conditions affecting hatching and growth; food habits; diseases; natural enemies; life span; years in which it makes its greatest growth; period of best reproduction; period of greatest natural mortality; how it reacts to the environment; and other things.

For example, if the biologist knows how many years a certain species requires to grow to its most profitable size, and if he knows where and when it spawns, he can study the hatch each year and get information which will help him predict when the catch will be good and when it will be bad.

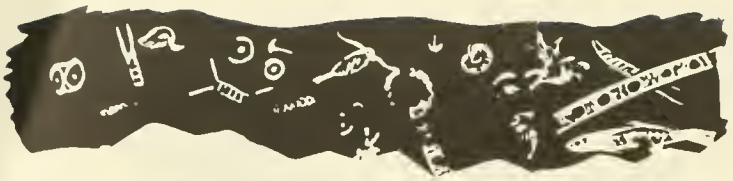
But the biologist must also know what factors affect the fish during the maturing period. Some fish--tuna, cod, and haddock for example--deposit their eggs in the open ocean and leave them to the mercy of wind, weather, and ocean currents. Some fish--salmon, for one--move into inland waters and place their eggs in "nests" that the fish brush out of the gravel beds with their tails. Menhaden and shrimp lay their eggs in the open sea but usually the larvae drift into sheltered places in estuaries or along tidal marshes.

Habitat.--The biologist must learn about the habitat of the fish: where it lives, deep or shallow water; factors that aid or hamper growth, such as salinity of the water, temperature, light, and food supply; factors that affect food supply and temperature, such as currents and winds; presence of mineral and other nutrients in the water; conditions that might lead to epidemics; and its predators.

Human progress has added new habitat problems by damming rivers and altering watersheds, and by changing coastal marshes, either filling or draining them or building canals or other structures.

Fish eggs and "fry," or baby fish

Biologists are finding ways to control drills and starfish--important predators on oysters



Plankton, floating plants and animals so tiny we cannot see them with the naked eye, are food for baby fish, some whales, sharks, and other aquatic animals

Biologists tag lobsters to learn more about them, such as how long they live, how fast they grow, and how far they travel

SCUBA divers have learned many things about fish and fishing

Biologists are studying the green crab, which in recent years has become an important predator on softshell clams

The food chain.--Plankton is the beginning of most food chains. Composed of small, sometimes microscopic, plants and animals, it is food for small aquatic animals which in turn are food for larger aquatic animals. It depends on minerals and other nutrients in the water and on light and temperature to survive. Some of the minerals are carried to the rivers by runoff; the rivers carry some to the ocean. Other minerals have been in the ocean for ages and are brought up from the lower levels by "upwellings," or water currents that rise to the surface. The minerals are then spread over wide areas by wind and ocean currents. Hence, temperature studies, water samples for chemical content and plankton, and knowledge of "drift" or water movement produce important information.

Tagging.--Tagging fish is as important to fishery research as banding ducks is to waterfowl studies. Various kinds of tags are used--small metal disks, plastic loops, small capsules, and plastic darts. Sometimes a small metal tag is placed in the abdomen of a fish; electric detectors must be used in these cases. Research is being done on radioactive tags. Tagging not only tells us how fish migrate but also allows biologists to estimate total numbers present and the proportions that are caught or escape to spawn.

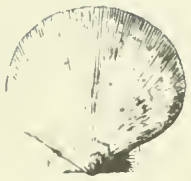
Color marking.--Dye is used for marking shrimp because tags are lost when the shrimp sheds its old shell. The color remains in the head for several months.

Underwater television and SCUBA divers.--It is now possible to observe consistently for the first time in history just how fishing gear operates under water, to make recommendations to improve gear, and to study the effect of gear on fish. These studies can lead to more efficient gear and less waste of the fishery resource.

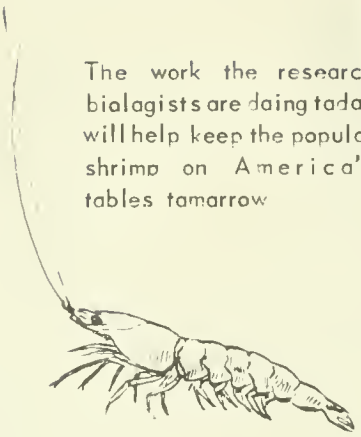
Chemical aids.--After testing 5,000 chemical formulations the Bureau of Commercial Fisheries found a "selective" poison which will kill sea lamprey larvae and not harm desirable fish, paving the way to restore Great Lakes trout fisheries. Selective chemicals to control green crabs (clam predators) are also being studied. This is a field of great promise.

Electrical aids.--These aids include fish finders to locate fish; telemeters to give the location of a fish trawl in the water; electrical fences that kill unwanted fish; cameras with which the fish takes its own picture; apparatus by which fish count themselves as they move up and down stream; a "sonic tracker," an inch-long tube attached to the fish which sends out "beeps" for hours. Researchers are perfecting electrical fences that will guide fish away from danger spots, as turbines and intakes at dams, and a device by which the fish will "tag" themselves by triggering an identification dart as they swim past.

The sea scallop moves swiftly thraugh the water and aver the acean flaar by quickly apening and shutting its two beautiful shells



The work the research bialagists are daing taday will help keep the popular shrimp on America's tables tamarrow



Other Information

Sounds.--Fish have no vocal chords but they make sounds with their teeth and airbladder. When the male seatrout, or weakfish, sends out his mating call by vibrating his airbladder with a special muscle, he can be heard 50 feet under water; a species of mackerel grunts like a pig; a type of catfish growls; the conger eel barks; the oldwife chirps; a Mediterranean variety of weakfish which has a musical call is believed by some to be the basis for the "Siren" of Greek mythology who lured sailors onto the rocks.

Sea mammals.--Whales, walruses, sea otters, seals, and sea lions are mammals rather than fish. Several thousand whales are taken each year under regulations of the International Whaling Commission; only two or three hundred of these are taken by American whalers, operating out of two California whaling stations. Extensive studies are being made on the walrus. Sea otters, once a source of fine fur, almost disappeared but are now increasing under full protection. Sea lions are an "unwanted" animal, believed by some to be a threat to the salmon fisheries, and as yet are valueless for commercial purposes. Fur seals are protected by international agreements. The United States manages the big American herd on the Pribilof Islands in the Bering Sea, and each year takes more than 60,000 prime skins for the market. Under the terms of an international treaty with Japan and Canada, the United States gives 15 percent of the American skins to each of these two countries.

International commissions.--International commissions have been established to guide management and research problems in many fisheries used by two or more nations. These include the International Commission for Northwest Atlantic Fisheries; International North Pacific Fisheries Commission; Great Lakes Fisheries Commission; International Pacific Salmon Fisheries Commission; Pacific Halibut Commission; Inter-American Tropical Tuna Commission; and the International Joint Commission (Canada and the United States).

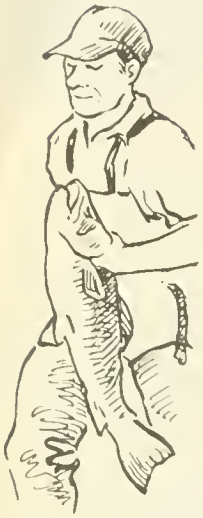
Interstate commissions. --States which have common fishery problems have formed organizations to meet these problems. These groups are the Atlantic States Marine Fishery Commission, Gulf States Marine Fishery Commission, and the Pacific Marine Fisheries Commission.

The American catch.--In recent years the value of the catch to fishermen has varied between $250 million and $275 million annually. Shrimp leads in value, brings $75 million a year at boatside.

Lobsters are measured for legal size

Cod

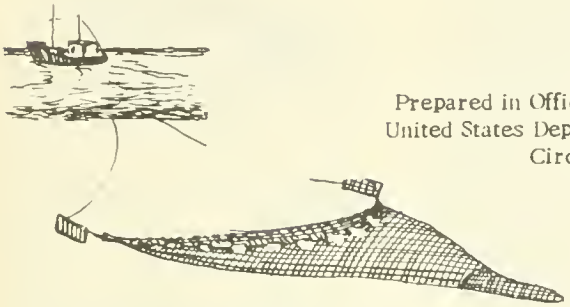
Humpback whale playing



Fishing for Food

It takes a lot of gear to catch 5 billion pounds of fish, the annual United States harvest. Some 14 million hooks and 1 million lobster, crab, and crawfish pots bring in about 11 percent of the catch; 2,400 purse seines, which encircle schools of many species, take nearly 50 percent of the catch; 9,000 bottom trawls (sacklike nets dragged along the bottom), take 20 percent; 28,000 gill nets, 4 percent; 3,300 pound nets including fish traps, 4 percent; shellfish dredges, 2 percent; the balance of the catch is by miscellaneous gear.

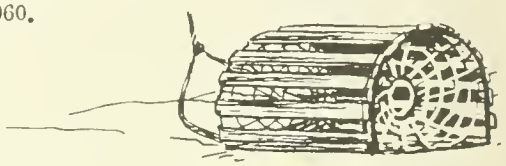
More than 80,000 water craft are used in commercial fishing, including 48,000 motor boats and 11,000 vessels varying in length from 40 to 200 feet. There are 150,000 men on the boats and another 350,000 engaged directly or indirectly in the fisheries and related industries.



Otter trawl

Prepared in Office of Information, Fish and Wildlife Service, United States Department of the Interior, Washington 25, D. C.
Circular 55. Revised October 1960.

Lobster pot



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