See warning for mankind in fate of fish

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WASHINGTON, D.C. — Slow but ominous changes are being detected in the sea life of the world:

In the North Sea, cels have cauliflower-like growths on their lips. Soles and flounders along the U.S. Pacific Coast have large lesions on their skin. White crustacea feeding around sewage outlets along the California coast develop tumors around the mouth. Thousands of halibut have had to be thrown away because they were listless, underweight, their skin soft to the touch.

"Diseases in fish have been directly linked with chemicals in the environment," says Dr. John C. Harshbarger, pathologist with the Smithsonian Institution. "While no one has directly linked a pollutant with cancer in fish, the circumstantial evidence is there."

In Japan, the goby fish develop mouth tumors. Cunner in Rhode Island have cancerous tooth tumors. Large catfish in the central lakes of Florida grow tumors the size of a finger joint. Oysters are found with leukemia. A dogfish in Maine has a brain tumor. In the tributaries of the Chesapeake Bay a cancer epidemic has broken out among the small, inedible clams that live in the mud flats.

The ways that fish are responding to new factors in the environment give a clue to how man may also be changed, gradually, by a world he is constantly changing, the scientists say. In fact, because of certain biological similarities between man and fish, some scientists see the reactions of fish as an accelerated example of what eventually may happen to man himself.

Channel catfish in Arkansas have broken backs. Oysters have trouble growing thick enough shells. Flatfish are seen off both coasts — victims of fin rot disease. Two species of fish in the Chesapeake are said to have doubled the size of their livers. In fish, as in human beings, the liver is the organ that metabolizes toxic materials.

Marine explorer Capt. Jacques Cousteau has been diving in the waters of the Mediterranean, Red Sea, Indian Ocean, North and South Atlantic, Pacific, Arctic and Antarctic since the 1930s. He estimates that the over-all fish population of the world has decreased at least 30 per cent in the last 20 years.

Since World War II, man has been living in a chemical age. New drugs and chemical therapy have successfully treated mental illness and cancer. Insecticides have increased food production and eradicated diseases like malaria and yellow fever. Plastic

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Chemical's effect almost invisible

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bags, vinyl seat covers and instant freeze-dried food are household words.

At the same time, according to the National Cancer Institute, an estimated 70 to 90 per cent of all human cancers are associated with environmental factors. Many birth defects and neurological disorders have been linked to chemical causes.

The National Institute for Occupational Safety and Health has put more than 12,000 compounds on their toxic substances list; 1,000 of these chemicals are suspected of causing tumors. Before Congress is a toxic substance bill to regulate the registration, production and use of new chemicals.

Government agencies such as the Environmental Protection Agency, the Food and Drug Administration, the Fish and Wildlife Service and the National Cancer Institute are trying to determine what the risks really are in the environment, and to do something about them.

Early Warning System

More and more scientists and government officials are turning to fish as an early warning system. Midway on the predator-prey food chain, fish serve a dual purpose — first as indicators of what chemicals persist in the environment, second as test animals in the laboratory.

Fish are a Dick-and-Jane textbook of human physiology. Metabolically speaking, they are like mammals in slow motion. But simplicity aside, the basic functions are similar.

"If you have an effect on the liver of a fish, which is a vertebrate, then you might expect to have the same effect on mammals, including human beings," explains research ecologist Del Wayne Nimmo of the U.S. Environmental Protection Agency's laboratory in Florida.

Scientists know, for example, that DDT attacks the nervous system of fish. Stored up in the liver, it can send a lobster under stress into convulsions.

In the laboratory, low levels of the toxic compound polychlorinated biphenyls (PCB) affect the thyroid gland in fish. In higher amounts, PCBs cause the fins of fish to rot off.

Low levels of the insecticides aldrin and dieldrin alter the amino acids metabolism in fish and produce signs of mental retardation.

An Example

Mirex is the most effective insecticide against fire ants. About 80,000 pounds of this stable chlorinated hydrocarbon are produced each year.

Initially Mirex passed all the standard screening tests for being toxic to marine life. Then, at a government laboratory in Florida, juvenile blue crabs, fed corn-cob grits contaminated with low levels of Mirex, displayed an ominous delayed reaction.

They could no longer use their pinchers to catch prey for food. The crabs became disoriented and more and more paralyzed.

In the sea jungle a paralyzed predator quickly becomes prey, and a crab that cannot use his scissors does not survive. In the controlled water tank of the laboratory the crippled crab becomes scientific testimony to the invisible erosion of the environment — and the potential hazards to mankind.

"Chronic Mortality"

Acute poisonings such as a massive fish kill are easy to see. It is what you don't see that may have a more devastating impact on the future, the scientists say. The slow, subtlethal, almost invisible changes caused by pollutants in the environment produce slow, subtlethal, almost invisible changes in living creatures. It is precisely these subtle changes that one government scientist describes as "dying over a long period of time . . . chronic mortality."

Scientists say the critical difference between nature and laboratory testing is that, in the environment, no one chemical exists in isolation. In the central lakes of Florida, for example, where the large catfish are found with tumors, more than 50 toxic compounds were analyzed in the water.

What's more, only the adoptable survive. In the polluted lower Mississippi River the large-mouth bass have disappeared, and the mosquito fish is king.

It turns out that this rugged little fish has built up an immunity to toxic chemicals. In laboratory tests, scientists find that the 1½-inch-long mosquito fish is 100 to 1,000 times more resistant to insecticides than the larger — and commercially edible — fish.

Key to Adopting

In this survival of the fittest what makes the large-mouth bass a modern dinosaur? The key to adopting to a new chemical environment may lie in how often an organism reproduces. The little mosquito fish produces young every month. The larger fish produce only once or twice a year.

"The phenomenon of the mosquito fish is a sign that one species is better able to cope with pollution than another," says David J. Hansen, aquatic ecologist with EPA's Florida laboratory. "Resistances may go to those species who can reproduce the most often so the resistance trait is quickly passed on."

In general, fish are much more vulnerable to disease and biochemical change than human beings. If a chemical is toxic in low levels to fish, it does not automatically mean that it is toxic to man. At the same time, it is a red flag.

Fish First

Since waterways are a major chemical sink, if there is a pollutant in the environment, fish are likely to get it first.

In industrial areas of the Northeast and Midwest — the Great Lakes region or along the Hudson River — scientists find high levels of the toxic industrial residues of insecticides like DDT, aldrin, dieldrin and toxaphene.

The residue levels of these compounds are then supplied to research laboratories to study the response of living organisms to these persistent chemicals.

A major emphasis is on chronic effects. It is one thing to expose a rat or a monkey to high levels of a chemical and produce a tumor. It is another to relate that phenomenon to the realities of nature.

With fish, the levels that are detected in the environment are used in the experiments. The laboratory becomes a microcosm of what is actually taking place.

Trace Toxaphene

About six years ago a strange phenomenon cropped up in the commercial fish farms of Arkansas. Some of the channel catfish had broken backs. They couldn't swim properly. They flopped from side to side. They couldn't maintain their normal position in the water.

Recently two government scientists linked this crippling in fish with one of the most widely used insecticides in the United States—toxaphene.

What's more, the broken back syndrome was only the tip of the iceberg. Drs. Foster L. Meyer, jr., and Paul M. Mehrle discovered that the over-all size of the fish was stunted by almost a third. Reproduction was down by 30 per cent. Skeletal deformation was so widespread that 30 per cent showed signs of broken back syndrome.

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All it took to produce these changes were low levels of the insecticide over a long period of time — levels that correspond to what has been measured in the environment.

Since DDT and aldrin and dieldrin have been banned by the EPA, toxaphene is now the country's leading pesticide. It is used predominantly in the South on cotton.

More than 1 billion pounds of toxaphene have been added to the environment in recent years to work their long-range effects on mankind's environment. It is but one chemical of many that are at work.

Low-Level Effects

A major aspect of the problem that haunts scientists is not just that chemicals are lethal in high amounts; of far more reaching significance may be the biochemical changes produced by very low amounts over longer periods of time.

At EPA's Florida laboratory scientists determined that roughly one-one-hundredth of the lethal dose of a chemical called PCB seriously affects reproduction of salt-water fish.

Aldrin and dieldrin produce similar fears. In 1972, 13 million pounds were produced in the United States. The two insecticides have been banned because they caused cancerous tumors in experimental animals.

But like DDT, PCBs and toxaphene, aldrin and dieldrin seem to be persistent in the environment and residues still are found in fish. The levels are relatively low, but these low levels are capable of producing significant physiological changes.

In rainbow trout, for example, dieldrin produces all the biochemical trademarks for PKU, the metabolic disorder in human beings that leads to mental retardation.

It only took three-tenths parts-per-million for 300 days to produce this effect.

Scientists quietly are testing chemical after chemical on fish. Only in the last three years has this type of research taken on a major responsibility in the screening of toxic substances. The process is slow.

"If we see an accumulation of a chemical in food or in fish, it's a red flag," says Dr. B. Thomas Johnson, microbiologist at the Fish-Pesticide Laboratory in Missouri. "We're not saying a compound should not be used. We are saying it should be more extensively studied before it is released into the environment."

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