clear guidance and that, in fact, work contrary to their production efforts and discourage conservation practices that have been so successful since the 1930's. I commend the following to the attention of my colleagues.

RESOLUTION

Whereas the present agricultural policy of the United States Government is bringing a constant decline in the number of American farms, and

Whereas the present world food crisis is placing these policies in serious question and

Whereas family owned farms represent the best means of preventing the exploitation of agriculture

Be It Resolved: That the United Methodist Kansas West Conference declares its support for the family owned farm.

That the Conference Council on Ministries be directed to investigate work existing in Kansas and other areas; develop programs and carry out actions supporting the cause of family farming, seeking legislation to protect the family owned farm and developing other policies and programs to renew and encourage rural life in America.

RESOLUTION

Whereas several representatives of Boards and agencies representing the United Methodist Church have taken positions advocating a reduction of beef consumption in the United States, and

Whereas various news articles and magazines have stories which advocate the reduction of beef consumption as a moral obligation for nations of the industrial world, and

Whereas these viewpoints are recognized as sincere but often based upon false and misleading information;

Be It Resolved: That the United Methodist Church Kansas West Conference declares its support for all those engaged in agriculture who attempt to apply standards of justice and who seek equity in their endeavors.

To declare that those engaged in food production are deserving of a fair price for honest labor and of clear governmental policies to direct their work equitably and justly.

To recognize that the production of meat protein by ruminant animals provides needed food and additional products useful to society and adding to the quality of life.

To recognize that ruminants make vast acreages usable which are unsuitable for producing other than range crops thereby putting these acres to exceptional use in raising food for people.

To condemn Government policies of "full production" which seek to use food as political power and which ignore needed policies of stewardship and conservation: And to discourage farmers in the midwest from following these policies by plowing up grasslands, contributing to the increased danger of drought and dust, violating our Christian obligations to the land, in a short-sighted effort to achieve profit.

To encourage legislation which will limit the importation of protein from peoples and nations which have lower protein use intake than our own.

CHEMICALS AFFECT FISH

HON. GERRY E. STUDDS

OF MASSACHUSETTS

IN THE HOUSE OF REPRESENTATIVES

Wednesday, September 17, 1975

Mr. STUDDS. Mr. Speaker, last Sunday's Washington Post contained an excellent article on the effects of pesticides and industrial chemicals such as PCB's on fish. I commend it to my colleagues:

FISH: MAN'S EARLY WARNING SYSTEM

(By Abigail Trafford Brett)

NOTE.—The author is a science writer for the American Chemical Society.)

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

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 slow, subtethal, almost invisible changes caused by pollutants in the environment produce slow, subtethal, almost invisible changes in living creature. It is precisely these subtle changes that one government scientist describes as "dying over a long period of time . . . chronic mortality."

Just how fish respond to new factors in the environment is a clue to how man also is being changed by a world he is constantly changing.

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

In a river in Rhode Island brown bullhead 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 unedible clams that live in the mudflats.

Channel catfish in Arkansas have broken backs. Oysters have trouble growing thick enough shells. Finless fish are seen off both coasts—victims of fin rot disease. Two species of fish in the Chesapeake Bay are said to have increased the overall size of their livers by a factor of two. *In fish, as in human* beings, the liver is the organ that handles toxic materials.

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

Since the 1930s marine explorer Capt. Jacques Cousteau has been diving in the waters of the Mediterranean, Red Sea, Indian Ocean, North and South Atlantic, Pacific Oceans, Arctic and Antarctic. He estimates that the overall fish population of the world has decreased at least 90 per cent in the last 20 years.

A CHEMICAL AGE

Since World War II man has been living in a chemical age. High-energy transformers are taken for granted. New drugs and chemical therapy have successfully treated mental illness and cancer. Insecticides have increased food production and eradicated diseases like malaria, yellow fever and encephalitis. Plastic 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 and neurological disorders have been linked for Occupational Safety and Health has put over 12,000 compounds on their toxic substances list; 1,500 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.

A number of government agencies are trying to determine what the risks really are in the environment and to do something about them: the Environmental Protection Agency, the Food and Drug Administration, the Fish and Wildlife Service, the National Cancer Institute.

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 first-grade 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 Delwayne R. Nimmo of the U.S. Environmental Protection Agency's Gulf Breeze Environmental Research 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 acid metabolism in fish and produce signs of mental retardation. Toxaphene, another insecticide, attacks bone composition. Only recently has the drama of chronic changes in the environment been documented in the laboratory.

IMMUNITY BUILT UP

The critical difference between nature and the laboratory 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 strong survive. In the polluted Mississippi River, the large mouth bass have disappeared and the mos*quito 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.

In this survival of the fittest, what makes the large mouth bass a modern dinosaur? The key to adapting to a new chemical environment may lie in how often an organism reproduces. The little mosquito fish produces young every month. The larger fish produces 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," explains David J. Hansen, aquatic ecologist with EPA's Florida Laboratory. "Resistance may go to those species who can reproduce the most often so the resistance trait is passed on."

In general, fish are much more vulnerable to diseases 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.

The National Pesticide Monitoring Program of the Fish and Wildlife Service has 100 stations across the country. Whole bodies of fish from the local area are ground up and analyzed. Instead of isolated water quality measurements, fish residues give an average profile of what exists in the environment on a quasi-permanent basis. And since waterways are a major chemical sink, if there is a pollutant in the environment, fish are likely to get it first.

A regional map of pollution emerges. 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 compound PCBs. In the agricultural areas of the Southeast they find high 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. The Department of Interior's Fish-Pesticide Research Laboratory in Columbia, Mo., for example, works with fresh water fish. The Mt. Desert Island Biological Laboratory in Maine and EPA's Gulf Breeze Laboratory in Florida concentrate on marine species.

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.

CRIPPLED CATFISH

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. Under nature's law of survival, these crippled creatures quickly disappeared. But the mystery of the so-called broken back syndrome remained.

Recently, two government scientists at Missouri's Fish-Pesticide Laboratory 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. Mayer Jr. and Paul M. Mehrle discovered that the overall size of the fish was stunted by almost a third. Reproduction was down by 80 per cent. Skeletal deformation was so widespread that 80 per cent showed signs of broken back syndrome. At first, the fish appeared to be normal, but X-rays revealed that dramatic anatomical changes had taken place. It was only a question of time before the bones became so brittle that the spine snapped.

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. According to EPA figures, 76 million pounds of toxaphene are produced a year. Since the chemical revolution began after World War II, more than a billion pounds have been added to the environment.

In Arkansas, many commercial catfish farms are next to the cotton fields.

LIVER DAMAGE

Another quasi-permanent factor in the environment are the industrial PCBs, essential in the electronics industry. Highly resistant to heat, PCBs are used, for example, in hydraulic fluids for high-energy transformers. An efficient plasticizer, PCBs have also been used in household paints, caulking materials and copy paper. In 1970 the Monsanto Company produced 85 million pounds of the super chemical.

Meanwhile, scientists discovered that high amounts of PCBs caused liver damage in experimental animals and affected reproduction. An outbreak of PCB poisoning from contaminated rice oil took place in Japan where roughly a thousand people suffered from a skin disease and more than a dozen died.

Monsanto alerted its customers to the toxic effects of PCBs and limited the use of the compounds to closed system heat exchangers. The FDA set regulations of 5 ppm (parts per million) and under for food and animal feed. Production is now down to 40 million pounds a year.

But the damage has been done. Results from the national pesticide monitoring program show that PCBs are still a major pollutant in the environment. High residues exist in fish, particularly in industrial areas. In 1971, before the curb on production, residues reached as high as 200 ppm in Hudson River fish. Levels currently detected in the Great Lakes are still eight times above FDA regulations.

As a result of PCB contamination, commercial fishing in Lake Michigan essentially has been stopped since 1971. Recently, state officials in New York warned consumers not to eat striped bass from the Hudson River or salmon from Lake Ontario. The city of St. Louis just closed its public fishing pond stocked with carp because the fish were found to be polluted.

The environmental problem is that PCBs accumulate in the tissues of fish. While water samples may only show trace amounts of the chemical, fish are a living storehouse of the toxic substance.

What haunts scientists is not just the fact PCBs are lethal in high amounts. Of far more reaching significance may be the biochemical changes produced by very low amounts of PCBs. At EPA's Florida laboratory, scientists determined that roughly 1/10th of the lethal dose seriously affects reproduction of salt water species. In one experiment, sheepshead minnows were exposed to 1.5 ppm PCBs for a month. After the fish spawned, the eggs were placed in clean water. Only 26 per cent of the young from these eggs survived.

While no such dramatic effect took place with fresh water fish, significant changes occurred. In channel catfish exposed to only 2.4 ppm, the thyroid activity increased by 60 to 80 per cent. In salmon the same effect was seen with one half of a part per million—1/10th of the lethal dose.

The thyroid gland is the key regulator in fish. It is associated directly or indirectly with all physiological functions such as oxygen consumption and carbohydrate metabolism.

"We are looking at the subtlethal, biochemical effects that are not really causing mortality," explains Dr. Mehrle at the Fish Pesticide Laboratory in Missouri. "But when the subtethal effects concern a parameter like the thyroid gland which controls the behavior of fish, you are talking about chronic mortality."

INSECTICIDES BANNED

Aldrin and dieldrin have a similar story to tell. 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. At the Fish-Pesticide Laboratory in Missouri, scientists showed that dieldrin alters the amino acid metabolism of fresh water fish. 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 3/10ths ppm for 900 days to produce this effect. To be sure, scientists noticed no visible changes in the fish in terms of overall size or in general behavior. Nor could they say that a change in amino acid metabolism was not a healthy adaptive response for a fish to a chemical change in his environment.

"The point here is that the residues of dieldrin it took in the fish to affect the amino acids and produce the biochemical signs for PKU were in the same range of the dieldrin residues measured in fish by the national monitoring program," Dr. Mehrle points out.

FOUR QUESTIONS

There are four questions scientists ask about each chemical tested: 1. Does the compound degrade, leaving no chemical trace, or does some form of it persist, becoming a quasi-permanent factor in the environment? 2. If the compound persists, is it readily absorbed by living organisms, starting at the bottom of the food chain in plants and on up to man? 3. If the chemical is taken in, does it build up inside the organism? 4. What are the biochemical consequences?

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," explains Dr. E. 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."

Last year, the Missouri laboratory tested 76 chemicals for effects on fish. The majority turn out to be benign with a few notable exceptions and it is the exceptions that are significant.

The object not only is to determine the consequences of chemicals already in the environment but to assess the potential damage in new compounds.

The stakes are high. Chemicals have become an integral part of people's lives.

"For these reasons, we have to be very careful," explains Dr. Mayer, chief chemist at the Fish-Pesticide Laboratory. "Every night I lie awake thinking. Have we forgotten something in our experiments? Just one little thing can make the experiment go either way. Either the use of a chemical is crushed or a compound slips through that will crush the environment."

CONSULTING FIRM REPORT ON THE DOMESTIC OIL PRICING SYSTEM AND THE IMPACT OF OIL PRICE DECONTROL ON THE AMERICAN ECONOMY

HON. LEONOR K. SULLIVAN

OF MISSOURI

IN THE HOUSE OF REPRESENTATIVES

Wednesday, September 17, 1975

Mrs. SULLIVAN. Mr. Speaker, I recently received in the mail from Mr. Jesse Calhoon, president of the National Marine Engineers' Beneficial Association, a pertinent and interesting study prepared by a Washington consulting firm which is an analysis of the domestic pricing system. Since we are con-