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fish-eaters have them but fish haven't

What really killed the birds? Has DDT taken the blame for PCB?

By THOMAS CLARIDGE

Polychlorinated biphenyls have been blamed for the deaths of thousands of birds in the Irish Sea and of gulls in the Great Lakes, but so little is known of the industrial pollutant that scientists are unable to confirm the reports.

PCBs are chlorinated aromatic hydrocarbons that, because of their stability under heat and resistance to chemical change, are widely used by certain industries. They have polluted areas virtually untouched by man and scientists theorize that they travel mainly through the atmosphere, possibly through evaporation or co-distillation with water.

But wildlife specialists are concerned that PCBs may in some way interfere with the reproduction process in animals.

"Since they are chemically very similar to the DDT group, we must know whether they exert the same physiological activity," Anthony Keith, head of the Canadian Wildlife Services, pesticides section, said in an interview.

Scientists have established that DDE, a metabolite of DDT, is responsible for a reduced thickness in the eggshells of several types of eagles, hawks and falcons. A probable reason is the prompting of an enzyme change in the birds' liver.

"The DDT group is a very good enzyme stimulator, even at very low levels," Mr. Keith said. "In attempting to break down itself it also breaks down other large molecules including sex hormones, and one of the sex hormones in birds is known to be involved with eggshell formation.

"So, since eggshell formation was a problem we were associating with DDE and since you could show DDE had this enzyme effect in lab experiments, the question was, could we do the same thing with PCB?

"The short answer was yes. PCBs have a very similar if not a better effect on liver enzymes than the DDT group."

However, when PCBs were applied to bird populations there was no apparent reduction in shell thickness. "The result was instant confusion," the scientist said.

Another concern is that PCB levels may reach the point where water, land or air becomes toxic to some forms of life.

Mr. Keith is slightly skeptical about the report that PCBs were responsible for bird deaths in the Irish Sea. "We've only seen the very thinnest reports here which simply reported high PCB levels in the birds."

The discovery of PCB in about a dozen dead herring gulls collected this year by Ontario Department of Lands and Forests employees has done little more than add to the confusion.

Analysis of the birds by Dr. Richard Frank, head of the Provincial Pesticides Laboratory in Guelph, indicated PCB levels in some of the birds of several hundred parts per million. Dr. Frank tentatively concluded that PCB was a factor in the gulls' death but sent samples to Ottawa for further analysis.

Using a mass spectrometer, Dr. Robert Lee of the federal air pollution control service confirmed the presence of PCBs but found that in some in-

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Chemical is newly identified as a pollutant, yet found everywhere

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stances the levels had been over-estimated.

R. O. Stanfield of the provincial fish and wildlife service in Maple said the confusion grew with the discovery that while most healthy gulls have lower levels of DDT and PCBs some healthy ones have levels as high or higher.

"So trying to interpret this is very difficult," he said, adding that the cause of the gulls' deaths is being listed as undetermined.

Another mystery is that while fish-eating birds often have high levels of PCBs there has been little success in finding measurable amounts of PCBs in fish.

"We really don't know where the PCBs are coming from," Mr. Stanfield said. "All we can do now is to continue our surveys and make sure every dead gull is tested."

Although PCBs have been produced for almost 40 years, it is only recently that scientists have tried to establish toxicity levels for a region's flora and fauna.

One of the first papers published on the subject appeared recently in the Bulletin of Environmental Contamination and Toxicology, published in New York. In it, three scientists attached to the U.S. Bureau of Commercial Fisheries reported that while juvenile pink shrimp and oysters were killed within 48 hours by 100 parts per billion of a common PCB, Arocior 1254, juvenile pintish were unaffected.

The tests were conducted at Gulf Breeze, Fla. The scientists also told of finding 275 parts per billion of Arocior 1254 in an outfall in the nearby Escambia River.

Mr. Keith said that even if studies do determine that PCBs are fairly toxic to some species the problem will not be as serious as an interference in the reproductive process.

"The point is that although the DDT group are not involved in direct mortality, it's the effect as inducers of reproductive deficiencies that poses the real threat. This is far more important biologically."

He said any population of vertebrates or invertebrates can adjust to sharp variations in adult mortality by a variety of techniques.

"But when you put something into the environment that acts as a true inhibitor of reproduction you've got something which in an evolutionary sense there is no defense against. Populations can't cope with that sort of thing."

Another scientist who became interested in PCBs through work with pesticides is Dr. Henry Hurtig, a research co-ordinator in the Canada Department of Agriculture, who feels the DDT family may have been taking blame for harm actually done by PCBs.

Dr. Hurtig said analysis of peregrine falcons, a species on the brink of extinction because of eggshell problems, shows the birds have high levels of DDT, mercury and PCBs.

"So you have three things which are all mixed up in this population failure," he said. "There's going to have to be some sorting out of what's really responsible here. One may be synergizing the other—aggravating the effect."

Dr. Hurtig said a Swedish authority on PCBs, Dr. Gunnar Widmark, told a recent scientific meeting there must be more investigation of the potential harmfulness of industrial byproducts like the PCBs.

Dr. Widmark contended that the nylon and teflon industries are discharging byproducts "which no one worries about today, yet which could be far more dangerous to the environment than pesticides."

Dr. Hurtig said the first job of scientists must be to calculate a risk-benefit ratio for PCBs.

"Quite out of the blue it has been determined that they are ubiquitous environmental contaminants. They have been found almost everywhere that people look. I think in this instance governments should be looking into the severity of the problem, and in concert with industry they should see what hazards there are in the fact they have become general pollutants."

He said first priorities in research work have always been related to human health problems.

"There never was any suspicion that PCBs might be reaching man," he said. "Well, now of course they might in fact be reaching man through his food chain."

While scientists like Dr. Hurtig feel PCBs may be responsible for some of the sins of DDT, a few scientists argue that the opposite may be true.

Lloyd Monkman, a researcher with the federal air pollution control service, suggests that PCB production couldn't have been on a large enough scale to account for the world-wide spread of the chemical.

"I would say there's another possible explanation," he said. "This may be far-fetched, but when people in agricultural areas say the amount of DDT already in the Candian environment is so large it doesn't really matter whether we put a lot or a little more into the environment in 1970, I start wondering.

"If you speculate that by long-term degradation in the environment, by exposure to cold and heat, rain and ultra-violet rays, DDT is converted into PCBs, then you've got an explanation for them being omnipresent."

He said the theory isn't entirely far-fetched since it has been determined that at least one PCB can be produced in a laboratory by irradiating DDT with ultra-violet light.

DDT and other pesticides are a working stockpile, readily available and spread quite uniformly across the country."

James Bruce, director of the Canada Centre for Inland Waters in Burlington, said the centre is concentrating research work on PCBs in two directions. "We are trying to find where they are coming from and the quantities being used." The work is being done mainly by economic geographers.

"In addition we are doing the first sampling this year for a program to assess the dynamics of movement of a number of toxic substances, including PCBs, in the lake environment."

The program, which he said involves co-operation of the federal Agriculture Department, National Research Council and the Canadian Wildlife Service as well as three federal agencies at the centre, will try to answer four specific questions.

"We are trying to find out how they get into the lakes, where they go once they get in, how they get out again and where they go in the food chain."

Dr. Bruce said first samples of sediment, water and organisms were taken about a month ago and an initial report on the work will be ready by next spring.

"We consider the report this year as a sort of pilot project which will give some preliminary results to allow us to assess which of the toxic substances in Lake Ontario are there in important quantities."

How important did he feel the PCB problem was?

"I've heard somewhat conflicting views from the specialists," he replied. "But I think that as consumption of DDT goes down they may relatively speaking become a more important problem.

"However, my hunch is that some of the heavy metals will pose an even more serious immediate concern."

He said PCBs "seem to be a very elusive substance. Their paths through the food chain are not all well understood."

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