
AUDUBON
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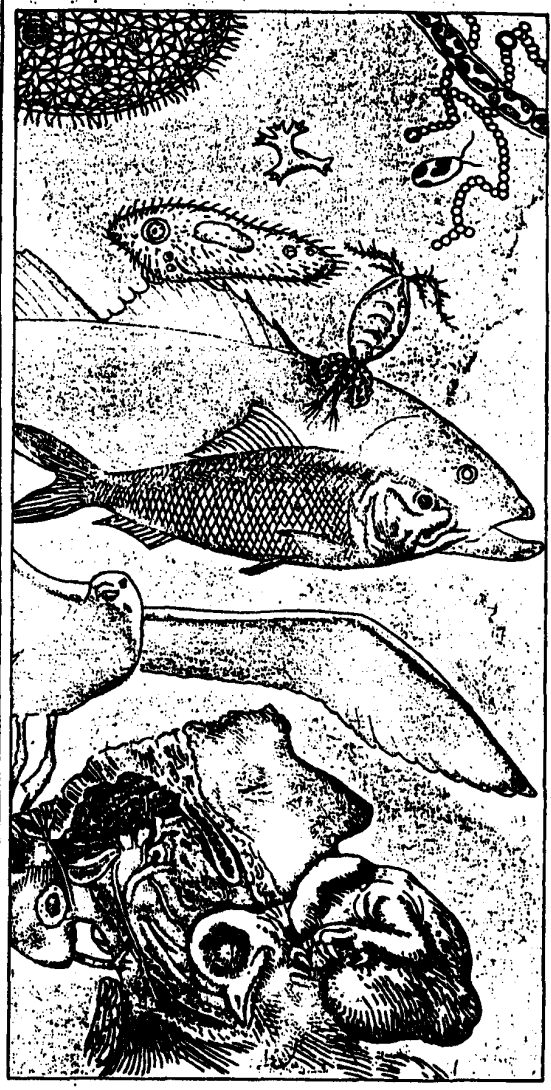
Of PCB ppms from GE and a SNAFU from EPA and DEC

Richard and Ina Ferris first heard the news on the radio when they were getting up on August 8th. The Ferrises run the Croton Bait and Tackle Shop in Croton-on-Hudson, New York, and as Richard says, "The news was a big shock. The first thing that hit me was what it would do to our business. But then I gave it some thought—I had believed the Hudson was coming along cleaner—and it just seemed as though someone had busted the balloon for everybody. It was heartbreaking having to tell the people who came in."

The heartbreak along the Hudson was caused by an announcement from Ogden R. Reid, commissioner of the New York Department of Environmental Conservation. Reid was quoted by Richard Severo in *The New York Times*, warning the public not to eat striped bass from the river or salmon from Lake Ontario. Prompted by a report received from the U.S. Environmental Protection Agency, Reid said that the striped bass had more than 5 parts per million of PCBs in their flesh, the federal Food and Drug Administration tolerance limit for fish.

PCBs, or polychlorinated biphenyls, are heat-resistant compounds widely used by industries throughout the world. They are tough chemical cousins of DDT, and they are toxic to a wide range of life, including humans, where they have caused stillbirths in women.

Fish apparently ingest and store PCBs by taking in contaminated bottom sediments, eating lesser organisms, or simply by swimming through water containing PCBs. Some indication of the threat PCBs pose may be had from an answer given by Dr. James H. Wright, a chemical engineer with Westinghouse Electric Corporation, who testified at an Environmental Protection Agency hearing on proposed toxic pollutant effluent standards in May 1974. Asked by EPA



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attorney Alan Eckert. "When you took these steps to prevent the discharge of PCBs, did you attempt to flush out or clean sewers and drains contaminated with PCBs from old operations?" Wright replied, "I would be the most frightened man in the world to recommend the flushing out of old lines and old drains."

Until Reid's announcement, it was generally assumed that PCBs escaped into the biosphere by chance and not deliberate release. To Reid's dismay, he learned that two General Electric Company plants at Fort Edward and Hudson Falls on the upper Hudson, which manufacture capacitors, had been releasing, by the company's calculations, the incredible amount of 30 pounds of PCBs per day into the river. Company sampling records revealed the plants may have dumped 90 pounds of PCBs in a single day. The discharge from the Fort Edward plant began in 1942 and from Hudson Falls in 1951. Reid was further dismayed to learn that his very own department had known of the PCB contamination for several years but had said nothing to the public.

Ever since 1965, when New York voters overwhelmingly approved an unprecedented $1 billion "pure waters" bond issue, state officials have been blowing trumpets about progress against pollution. But not a word was said about PCBs. According to GE records, the New York Department of Health gave the two plants a water quality certification in 1971, and in 1973 the chief of the enforcement section of the Division of Pure Waters in the Department of Environmental Conservation did the same.

Bureaucrats in the Environmental Protection Agency have not exactly covered themselves with glory, either. For more than a year, EPA scientists and bureaucrats had known that General Electric was polluting the Hudson with PCBs, but EPA policy-makers stalled until they finally passed the buck to Reid. A few persons tried to take effective action but they were thwarted. In a memo dated May 31, 1974, Sandra P. Kunsberg, an attorney in the Water Enforcement Branch of the EPA Region II office in New York City wrote to Dr. Richard Spears, chief of the Surveillance and Analysis Division:

"Following the [toxic pollutant effluent standards] hearings [at which GE admitted dumping PCBs], in a memorandum from Alan Eckert to Meyer Scolnick, the Office of Enforcement and General Counsel in New York recommended that this office undertake a careful investigation of PCB discharges from the Fort Edward and Hudson Falls facilities to determine whether or not there exists a health hazard within the meaning of Section 504 of the FWPCA [Federal Water Pollution Control Act]."

This provision authorizes the EPA administrator to sue to restrain persons whose pollution of waters causes "substantial endangerment to the health of persons or to the welfare of persons, where such endangerment is to the livelihood of such persons . . ."

The recommended investigation was conducted in August 1974 by Dr. Royal J. Nadeau and Robert P. Davis of the Region II EPA laboratory, and they reported, based on GE figures, that the Hudson Falls plant was discharging up to 17.6 pounds of PCBs per day and the Fort Edward plant up to 30 pounds per day. Minnows collected below the GE discharges averaged 78 parts per million of PCBs, while a rock bass contained 350 ppm of PCBs, prompting Nadeau and Davis to write:

"The PCB level in the rock bass is greater than the maximum level documented for fish taken from any industrial river of the United States . . . This represents a new record for PCB contamination of freshwater fish." They also noted that "certain areas, particularly downstream from Station 4, are fished primarily by the youngsters of Fort Edward. Ingestion of these fish by the populace would certainly lead to contamination of specific tissues in their bodies as documented by previous investigators mentioned in the introductory section of this report."

Effective action was not forthcoming. Instead, last March the EPA Region II office stayed lenient abatement plans for the two plants after General Electric objected and demanded an adjudicatory hearing to challenge PCB limitations.

On July 7th of this year, Dr. Gilman D. Veith of EPA's National Water Quality Laboratory in Duluth, Minnesota, wrote a "review" of the Nadeau-Davis inves-

Those ubiquitous PCBs

The range of PCB uses is so broad that hardly anyone can escape some contact with them. As Karl E. Bremer of the Environmental Protection Agency Region V office in Chicago listed them last July for the Lake Michigan Toxic Substances Committee, the uses—past and present—of polychlorinated biphenyls include:

In transformers and power capacitors; as hydraulic fluids; as a diffusion pump oil; in heat transfer applications; as plasticizers; as adhesives in the manufacture of brake linings, clutch faces, and grinding wheels; in making safety and acoustical glass; and as a laminate of ceramics and metals.

In making washable wall coverings and upholstering materials; in adhesives for envelopes and tapes; in coatings for leaning board covers; as a delustering agent for rayons; as a flame-proofer for synthetic yarns; in waterproofing of canvas; as additives in paints and varnishes; in film casting solutions; in insulating tapes; in protection lacquers; in making plastic bottles; and in epoxy resins for protective coating of metals.

As a widely used additive in sealants—for caulking compounds and putty, for concrete and asphalt, as well as in fireproofing sealants for floors, doors, ceilings, and partitions.

In the printing industry, in the making of "carbonless" carbon papers; as a coating for papers used in thermographic duplicating machines; as an additive in xerographic transfer process (in Xerox toner); and as a plasticizer for printing plates and lithographic plates.

PCBs also are a byproduct of paper recycling, and have been identified in hardwood and softwood pulps. They are found in toilet soaps, barrier creams, in hydrated lime used to manufacture glass, in water treatment chemicals, in primer paints, coloring compounds, degreasers, in additives to zinc alloys, and in waxes used in the tool and die-casting process.

—ROBERT H. BOYLE

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tigation which was passed on to EPA in New York City and eventually to Reid. "This field investigation has revealed the largest source of PCBs into the aquatic environment that I know of," Veith wrote. "It is my opinion that this report has been written in a conservative manner and does not by itself adequately describe the significance of the General Electric discharge into the Hudson River . . . The river for many miles downstream from the General Electric discharge could be contaminated with PCBs at levels one hundred times over the 10 ppt [parts per trillion] guideline set forth by EPA in 1972 and a thousand times higher than the recommended water quality criteria" of 1 part per trillion.

Even after Reid made public his warning, Environmental Protection Agency bureaucrats in New York City were less than helpful. When John Harris-Cronin of the Hudson River Sloop Restoration Inc. requested in person a copy of the Nadeau-Davis investigation, Richard Flye, regional chief of the Water Enforcement Branch of EPA, told Harris-Cronin he would have to submit his request in writing. Aware of EPA runaround techniques, Harris-Cronin had brought stationery, and he immediately wrote out the request. Flye looked at the letter and then told Harris-Cronin that under the Freedom of Information Act "we have ten days to decide whether or not to honor your request, and the tactic we're going to employ with you is to use them all." Given such tactics, it is no wonder that in the Hudson Valley the joke is that EPA really stands for "Everyone's Polluting Again."

Polychlorinated biphenyls have been manufactured in the United States by one firm, Monsanto Industrial Chemicals Company of St. Louis. The company began production in 1929, and although it has played coy with its list of customers and production figures, estimates are that Monsanto produced 400,000 tons of PCBs between 1948 and 1973. It is not unusual to ship PCBs by rail by the tank-carful; Monsanto sells PCBs under the name of Aroclor. (In a bizarre touch, government scientific publications dealing with the toxicity of PCBs begin with the footnote: "Aroclor is a registered trademark, Monsanto Company, St. Louis, Mo. Mention of commercial products or trade names does not constitute endorsement by the Environmental Protection Agency.")



"We didn't need a $27.50 bird-feeder to see chickadees."

Monsanto makes Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268. The last two digits indicate the percentage of chlorine in the different compounds, except for Aroclor 1016, which actually contains 41 percent chlorine. PCBs also have been manufactured in Great Britain, France, Spain, Germany, Italy, Czechoslovakia, the Soviet Union, and Japan. Like DDT, PCBs are chlorinated hydrocarbons. Unlike DDT, which degrades in fifteen years, PCBs, especially the more highly chlorinated formulations, are essentially unalterable by microbial or physical chemical reaction. PCBs persist because enzymes are unable to shear the bonding between the chlorine atom and the biphenyl structure. The only efficient way to destroy PCBs is to burn them in a special industrial incinerator generating a temperature of 2,400 degrees Fahrenheit. Although PCBs have been in use for almost 50 years, they baffled scientists measuring DDT residues, who reported finding "unknown but chlorine-containing compounds." In 1966 Dr. Sören Jensen in Sweden identified the compounds as PCBs.

Unlike DDT, PCBs are not used as insecticides but have many industrial uses (see accompanying story). And just recently fish oil has been identified as a source of PCBs. It would be interesting to determine if menhaden is affected. In a report submitted this past summer to the Rockefeller Foundation, William L. Dovel of the Boyce Thompson Institute in Yonkers, New York, reported that "the Hudson estuarine system makes a major contribution to the menhaden industry of the Northeast. Larval and juvenile stages develop in the Hudson and move toward the sea, where they represent the most valuable commercial fish species taken along the North Atlantic coast. Menhaden are ground into protein meal and oil to form additives for poultry and cattle feed, margarine, paint, lubricants, resins, putty, caulking, linoleum, soap, fertilizers, ink, electrical cables, and antibiotics. The cost of poultry probably would be prohibitive were it not for the rapid growth attained by adding high-protein meal to chicken and turkey feed. Fish meal is a richer source of protein than

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soybean meal, its most important competitor. It contains amino acids not found in vegetable protein and a yet unknown growth factor which makes its use in feed formulas particularly desirable."

In 1971, by the time PCBs were present in a wide variety of products, Monsanto announced it would restrict sales to so-called "closed cycle" systems in transformers and capacitors. However, transformers do leak. Moreover, United States companies in nonelectrical manufacturing have been importing PCBs from abroad. Aside from deliberate release, PCBs get into the environment from the disposal of industrial and municipal wastes, burning of refuse, and leaching from dumps. According to a 1973 paper by Dr. George Harvey of the Woods Hole Oceanographic Institution, "PCBs are found universally in the sewage of major cities, although the atmosphere is the major pathway of global transport. Recently, 30,000 turkeys in Minnesota, 80,000 chickens in North Carolina, and many thousands of eggs from various localities were destroyed after they were found to contain very high concentrations of PCBs... PCBs have been found in all organisms analyzed from the North and South Atlantic oceans, even in animals living under 11,000 feet of water... Based on available data it seems safe to assume that PCBs are present in varying concentrations in every species of wildlife on Earth."

Parts of the Great Lakes region have been sorely hit. Starting in 1971, Michigan health authorities, primarily concerned about PCB levels, cautioned the public not to eat salmon or trout from Lake Michigan more than once a week. The Great Lakes states restricted the use of DDT in 1970, and since then DDT levels have dropped 87 percent in Lake Michigan fish. By contrast, PCB levels have remained ominously high. On November 8, 1974, Martin J. Schreiber, lieutenant governor of Wisconsin, wrote about PCBs to A. Gene Gazlay, then director of the Michigan Department of Natural Resources:

"There exists now a problem with contaminants in Lake Michigan that has the potential of destroying both sport and commercial fishing in all the Great Lakes. This situation could turn any efforts to develop the lake as a future protein source into a futile and frustrating endeavor.

"Evidence is accumulating that shows that one group of chemical contaminants, polychlorinated biphenyls, or PCBs, exist in dangerously high levels in Lake Michigan right now ... Because they are extremely fat soluble, and because they are extremely stable, they tend to bioaccumulate in the food chain with more success than other pollutants. In human beings, PCBs have caused skin disease, jaundice, and toxic damage to internal organs, especially the liver. In test animals, PCBs have caused swelling of internal organs, internal bleeding, and drops in reproductive capacity."

Schreiber went on to note that he had asked the Wisconsin Department of Natural Resources Board to intensify efforts on the PCB problem, and he ended by writing: "Unilateral action by each state is needed because sources in the Environmental Protection Agency feel that it will be three or four years before any federally imposed standards could go into effect. Wisconsin and the other Lake Michigan states cannot afford to wait that long."

According to scientists at EPA's National Water Quality Laboratory, all Lake Michigan trout and salmon greater than twelve inches in length exceed the FDA limit of 5 ppm of PCBs. Indeed, this past May FDA seized interstate shipments of canned and frozen coho and chinook salmon from Lake Michigan. The PCB levels were 7.6 to 10.9 ppm in the canned coho and 8.2 to 9.2 ppm in the frozen fish. This past summer the Sport Fishing Institute informed members that about half of the early-returning mature Atlantic salmon in the Boyne River in Michigan had died: "Laboratory analysis has resulted in a theory that PCBs may be the cause, in combination with other environmental stress."

In Lake Superior, large lake trout generally contain more than 5 ppm of PCBs. Two-fifths of the Superior basin is the lake itself, and the suspicion is that PCBs are entering the lake mainly from air, rain, and snow. By contrast, the sources of PCBs entering Lake Michigan are many and varied. A report by Karl E. Bremer of the EPA Region V office in Chicago noted that "cooling water from aluminum foundries in the Milwaukee area have been found to contain PCBs. The source of the PCBs has been identified as hydraulic fluids from die-cast machines. The survey is now being expanded to include other foundries." In Wisconsin, wastepaper used in recycling is a source of PCBs in streams entering Lake Michigan, and on the other side of the lake, the paper industry wastes in the Kalamazoo River create a contamination problem. And last winter, the Wisconsin Department of Natural Resources found that snowmelt in five of seven locations in the state contained traces of PCBs as high as .24 parts per billion.

In addition to fish, Bremer reported, "A serious situation exists with respect to populations of fish-eating birds in the Great Lakes area. Severe reproduction failure has been identified in herring gull colonies around Lake Ontario. There is a positive correlation between early embryonic mortality and PCB contamination. The major effect on young birds is to produce symptoms of chick edema disease [with] high mortality. Michigan officials have observed unnaturally high mortalities of gulls in recent years from Saginaw Bay and Grand Traverse Bay. Analysis of the liver and brain of a dead herring gull from Grand Traverse Bay in 1973 showed the presence of 2,600 ppm of Aroclor 1254."

Contamination from PCBs is of concern elsewhere, too. For instance, this year the Food and Drug Administration seized 20,000 pounds of carp from Lake Pepin, a stretch of the Mississippi River 70 miles downstream from Minneapolis-St. Paul. PCB levels were so high the FDA buried the carp. Carp and channel catfish taken from the Ohio River also have excessive PCB levels. EPA informed the West Virginia Department of Natural Resources of this on July 26, 1974.

In 1969, scientists at the Gulf Breeze Laboratory in Florida, now part of EPA, detected PCBs in oysters in Escambia Bay. A Monsanto plant that makes synthetic fibers had been releasing PCBs from its heat exchange or lubricant system into the Escambia River. Embarrassed Monsanto officials moved to correct the situation, and the release has diminished by quantifiable amounts. Gulf Breeze scientists have done a number of studies on PCBs and, curiously, the fish found to have the highest residues was not a predator but the silverside (*Menidia beryllina*), a species that feeds mainly on plankton. It is worth noting that in 1969 the Escambia Bay shrimp fishery went to hell. In 1968 landings totaled more than one million pounds; in 1969, 234,000 pounds; and in

1970 only 52,000 pounds.

Southern California waters contain PCBs, too. According to David R. Young and Theodore C. Heesen of the Southern California Coastal Water Research Project: "In contrast to DDT compounds, PCBs are widely discharged from submarine outfalls along the southern California coast . . . PCBs now constitute the major chlorinated hydrocarbon contaminant found in municipal wastewaters discharged to the Bight, amounting to approximately three and one-half times the input of DDT compounds."

At the May 1974 EPA hearings on toxic pollutant effluent standards a General Electric witness testified not only about the PCB releases into the Hudson but elsewhere as well. A General Electric transformer plant in Rome, Georgia, was discharging PCBs into the Oostanaula River "on the order of one pound per day." The effect on the biota of the river was unknown because, as the witness, Dr. Edward L. Simons, admitted, "We have made no measurements of biota for any facility of the General Electric Company."

Dr. Simons also testified that the General Electric transformer plant in Pittsfield, Massachusetts, released PCBs into the Housatonic River. In the vicinity of the outfalls, according to "occasional samples" by General Electric, the river water contained between 1 and 3 parts per billion of PCBs, while the levels in the sediment ranged from 130 to 1,300 parts per million. At "a distance of something between one and six miles" downstream, PCBs were "not detectable" in the water, but PCB levels in the sediments were 30 to 60 parts per million. Dr. Simons pointed out that the Pittsfield plant was releasing an average of only 0.1 pound per day of PCBs into the Housatonic, with "occasional excursions as high as 0.8 pound per day."

"To put that 0.1 pound per day in a possibly more illustrative format," Dr. Simons said, "that would correspond to a small jigger of whiskey, about one ounce, so we are not talking about a major spill. This is a relatively small volume of liquid." Later, Dr. Simons testified that "a loss of something on the order of one ounce during the day's operations is, we think, a very creditable performance. I don't know of any other really heavy manufacturing operation which handles fluids in which that kind of level of control is displayed."

For sheer screw-up, New York State takes first place. The September 29, 1972, issue of *Science* carried a paper by Dr. Donald J. Lisk and Carl A. Bache of the Pesticide Residue Laboratory at Cornell University and two other Cornell scientists reporting that all lake trout tested from Cayuga Lake contained PCBs, and that 80 percent of those more than 22 inches in length had levels that exceeded 5 ppm. The highest level, 30.4 ppm, was found in a nine-year-old fish. There was a "highly significant" correlation between PCB concentrations and the age of the fish. "The fish were netted in October 1970," the paper noted. "Their ages were accurately known, because the fish are annually stocked as yearlings and distinctly marked as to year class." No one in the state Department of Environmental Conservation bothered to call the Cornell scientists about their findings. In fact, the only call Bache remembers getting was from a chemical company representative (not Monsanto) who wondered where the PCBs were coming from.

To strike a personal note, I am not surprised by the past inactivity of the New York Department of Environmental Conservation. In the 1960s it actively suppressed information and photographs dealing with huge fish kills by Consolidated Edison Company's Indian Point No. 1 nuclear plant on the Hudson, and for several years the department officially treated the lower Hudson as nontidal (but it *is* tidal) because that apparently suited the corporate convenience of the power industry. Indeed, I was once dismissed from the stand at a DEC hearing on Consolidated Edison's proposed Storm King pumped-storage hydroelectric project because my sworn testimony that the lower Hudson was tidal was "hearsay."

I have had personal experience with DEC on PCBs. The October 26, 1970, issue of *Sports Illustrated* carried my long article, "Poison Roams Our Coastal Seas," dealing with DDT, PCBs, and other contaminants in gamefish from the Atlantic, Gulf, and Pacific coasts. The analyses, paid for by *Sports Illustrated*, were conducted by the WARF Institute in Madison, Wisconsin. They revealed, among other things, that Hudson River striped bass had 11.4 ppm of PCBs in the eggs and 4.01 ppm in the flesh. (These levels were also reported in my article, "The Hudson River Lives," in the March 1971 issue of *Audubon*.)

I hold a state scientific collector's license to seine fishes from the Hudson, and I am required to make an annual report. On February 17, 1971, I did so, and in my letter to Carl Parker, chief of the Bureau of Fish in the Department of Environmental Conservation, I told him of the DDT and PCB levels in the eggs. "These are grim figures," I wrote, "and I certainly think the state should warn fishermen not to eat striped bass eggs." I also told Parker that the levels in the flesh were "not great reading," and I suggested he read the *Sports Illustrated* article. Parker's reply was derisive.

For all this, documents obtained from DEC by John Harris-Cronin and Hudson Riverkeeper Tom Whyatt show that the state began collecting Hudson River fish as early as July 1970, although PCB analyses were not performed until 1972. PCB levels in excess of 5 ppm were found in largemouth and smallmouth bass, striped bass, northern pike, sturgeon, and white perch. One largemouth 14.7 inches long, taken at the mouth of Esopus Creek, had 53.81 ppm. In April 1973 DEC collected 22 striped bass from the Hudson River near the Tappan Zee Bridge. The fish were analyzed in 1974, and PCB levels exceeded 5 ppm in 18 of 22 fish. The highest level was 49.63 ppm. Not a word was said to the public. In May 1975 six striped bass were taken from the Tappan Zee area and analyzed; four of six had excessive levels, the highest 37.80 in a six-pound striper.

High PCB levels in Hudson River striped bass mean trouble elsewhere. After spawning in the Hudson, the bass disperse along the Atlantic coast at least as far south as New Jersey and at least as far north as the Merrimack River, 40 miles above Boston. It is impossible for a coastal fisherman to distinguish between a Hudson striper and bass that have migrated from Chesapeake Bay, with its numerous spawning rivers. No serious PCB contamination has yet been discovered in the flesh of adult fish in the Chesapeake system, but in 1971 Stripers Unlimited had four large female striped bass taken in southern New England waters analyzed for PCBs. The WARF Institute found the PCB levels were 13, 18, 37, and 46 ppm. No one knows the river of origin of these fish, which were caught in Narragansett Bay and off Nantucket.

In New York State in the early 1970s,

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information of vital importance to the public concerning PCB levels in Lake Ontario coho and chinook salmon was suppressed. As I was writing this article, a scientist who requested anonymity sent me copies of PCB analyses performed on Lake Ontario salmon by the Rome Pollution Laboratory of the Department of Environmental Conservation between December 23, 1971, and September 26, 1973. Seven chinook salmon collected in the fall of 1971 were analyzed. One chinook had 15.29 ppm of PCBs, and that was the lowest level of any chinook tested. Five of the fish had PCB levels ranging from 20.35 ppm to 27.23 ppm, and one salmon, a 6-pound, thirteen-ounce male, had 34.48 ppm.

One scientist within DEC, Ward B. Stone, wildlife pathologist at the Delmar Wildlife Research Laboratory near Albany, had warned administrators and superiors for several years that PCBs were a menace. His warnings, Stone says, were "futile," and there were times he wondered if he were crazy and the rest of the department sane: "No one really cared," says Stone. In one blunt memo, he wrote: "I hope the department begins to take some of these toxic problems seriously . . . because it is doubtful these problems can be put off. In fact, they have already been put off far too long."

Stone was busy testing and accumulating data. With Frederick D. Baker, Casimir F. Tumasonis, and Brian Bush, scientists in the state Department of Health, he worked on levels of PCBs and trace metals in waterfowl. Seven species of waterfowl were analyzed for PCBs, and in two of them—the greater scaup and white-winged scoter—PCBs were consistently found in tissues.

The greater scaup is a favorite with duck hunters, who regard the breast meat as especially savory fare. To quote from the report: "Measurable levels of PCBs were found in most of the available tissues of all specimens of greater scaup, a species that prefers large bodies of water (e.g., Lake Ontario, Long Island Sound, Great South Bay) during migration. The analytical data strongly suggest PCB contamination of these waters and the aquatic life on which the ducks feed. Since scaup are hunted for food and since 27 percent of the samples analyzed contained a greater level than 5 micrograms per gram, which is the legal limit for poultry products, surveys of this species on a regular basis would be desirable. The level found approaches that which has been shown to cause chick deformities and embryonic death in domestic fowl . . .

"White-winged scoters are very similar in their feeding and migratory habits to the greater scaup. They are primarily coastal during migration, although the specimens presented for analysis were collected from inland waters. All the specimens had measurable levels of PCBs. [The highest was 20.4 ppm in the muscles.] Because of the similarity in feeding and habitat, data for the scoters and scaup may be combined to establish the presence of PCB contamination in the waters that are their environment."

Two of six canvasback ducks collected from Canandaigua Lake in Ontario County had PCBs in their liver, muscle, and brain tissues. "These two birds may have been migrants from highly polluted areas," the report noted. One of the canvasbacks had levels of 16.1 ppm in the liver and 10.2 ppm in the brain. This same canvasback also had lead levels of 12.6 ppm in the liver and brain tissues, and the duck is believed to have died from malnutrition.

The occurrence of PCBs in canvasbacks is noteworthy inasmuch as last February the National Wildlife Federation petitioned the U.S. Department of the Interior to review the status of the species because the "once abundant canvasback duck is low in numbers and distributed over a diminishing range of suitable breeding and wintering areas. The stock of available breeding pairs is even lower as a result of the most unbalanced sex-ratio of any species of North American duck. This remnant canvasback population is faced with the loss of wetland habitat and with other stresses with which it is not equipped to deal."

Interestingly, according to the Stone report, "No Canada geese showed quantifiable levels of PCB or trace metals, except for one with cadmium in muscle tissue and two with mercury in liver tissue. The migratory movement of Canada geese over New York State and their feeding habits (they are primarily herbivorous) apparently preclude the accumulation of PCBs to any detectable degree."

In other animals, Stone has detected 30.16 ppm of PCBs in the liver of a great blue heron from Albany County and 16.57 ppm in the brain of a great blue from Cayuga County. A dead herring gull from Oneida Lake had 21.49 ppm in the muscle and 11.05 in the liver; an otter from Twitchell Lake in Herkimer County had 49.39 ppm in the brain; and a porpoise washed ashore at Westhampton Beach, Long Island, had 20.3 ppm in the liver.

There is increasing concern about the synergistic effects PCBs might have on animals or that they might reduce resistance to disease. For instance, in 1970 Milton Friend and Daniel O.



"You're a disgrace to the herd."

Traisen reported in *Science* that mallard ducklings fed Aroclor 1254 for ten days showed no apparent ill effects. The ducklings were then fed food without PCBs for five days and exposed to duck hepatitis virus. The mallards suffered significantly higher mortality than did birds not fed PCBs.

Among mammals, PCBs have had severe effects on the reproductive capacity of mink, and in a paper to be published in the *Journal of the National Cancer Institute*, Dr. Renate Kimbrough of the Center for Disease Control of the U.S. Public Health Service and a team of researchers found that female rats fed Aroclor 1260 developed liver cancer.

Very important research on primates has been done by Dr. James R. Allen and Deborah Barsotti of the University of Wisconsin Medical School. Allen and Barsotti fed two groups of rhesus monkeys PCBs in a laboratory experiment. One group got food containing 5 ppm of Aroclor 1248, and the other group received food with 2.5 ppm of the chemical. In two months, monkeys in both groups lost hair from their faces and necks and their skin took on a "sandpaper-like texture." Both groups came down with acne, although it took the 2.5 ppm group longer to develop it. After six months, both groups were bred to control monkeys that had not been fed PCBs. Six of the eight females in the 5 ppm group became pregnant. Four of the six reabsorbed the fetus or aborted, one had a stillbirth, and one gave birth to a very undersized infant. In the 2.5 ppm group, all eight females became pregnant. Three reabsorbed the fetus, and the other five gave birth to undersized infants.

And what of the human experience? In 1968 about 1,000 Japanese, nearly all on the southernmost large island of Kyushu, were officially diagnosed as having what is now called "Yusho" disease after they used rice oil that had been contaminated during processing with an estimated 1,000 to 3,000 ppm of PCBs. Estimates of the persons affected reached 15,000. Yusho symptoms include severe acne—or what is now called "chloracne"—chocolate discharges from the eyes, skin darkening, hearing loss, and neurological disorders. A number of newborn infants had abnormal skin pigmentation as the result of transplacental transmission of PCBs, and the majority of the fetuses born were smaller than the national standard. There were stillbirths, and according to a report by Japanese physicians, examination of one stillborn fetus showed abnormal skin and hair development.

Little clinical work on humans has been done in this country, although the Environmental Protection Agency calculates that half the population carry 1 to 3 ppm of PCBs in their fatty tissue. One would have thought General Electric might have done research on employes working around PCBs, but aside from transferring an employe suffering from chloracne to another operation General Electric has done nothing.

Several conservation organizations—the Natural Resources Defense Council, Hudson River Fishermen's Association, and Hudson River Sloop Restoration—have asked EPA Administrator Russell E. Train to take immediate action against General Electric under federal law to curtail the discharge of PCBs into the Hudson. In Congress, hearings on PCBs in fish have been scheduled by Representative Robert L. Leggett, chairman of the Subcommittee on Fisheries and Wildlife Conservation and the Environment of the House Committee on Merchant Marine and Fisheries—at the request of other congressmen, Representatives John D. Dingell of Michigan, Edwin B. Forsythe of New Jersey, Richard L. Ottinger of New York, and Gerry E. Studds of Massachusetts.

The simplest solution to the PCB problem would be for Congress to ban the chemical, as Japan has done. Meanwhile, in New York Commissioner Reid has now advised the public not to eat any fish at all from the Hudson, and he reports PCBs have been found in fish from the Mohawk River and the St. Lawrence. Reid has charged that "by discharging the toxic and deleterious substance PCB for more than twenty years, General Electric has done serious if not irreparable damage to the Hudson."

In a complaint brought in September, the New York Department of Environmental Conservation accused General Electric of violating state water quality standards and the state Environmental Conservation Law, and a hearing was scheduled at which DEC was to seek an abatement order requiring the company to reduce its PCB release to two pounds a day by the end of this year and zero by September 30, 1976. DEC is also asking that civil penalties be assessed against General Electric, that the company "take steps to restore the Hudson and to eliminate contamination of the river," and that it post a minimum compliance bond of $2 million.

And another investigation has been ordered by Reid. "There has been a failure of government here, and some failures within the department," the commissioner says. "I think the public is entitled to know all the facts."

—ROBERT H. BOYLE

Know Audubon's regional fieldmen

Periodically we publish a list of the National Audubon Society's regional representatives. Here is an updated roster of the fieldmen who serve in our nine regions and the states for which each is responsible:

Northeast: Richard C. Rhindress, P.O. Box 151, Stephentown, New York 12168 (Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, Vermont).

Mid-Atlantic: Richard J. Martyr, P.O. Box 4181, Harrisburg, Pennsylvania 17111 (Delaware, Maryland, New Jersey, Pennsylvania, Virginia, West Virginia).

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