

This system of voluntary control appears to have worked better in Britain than in America where Monsanto was slower to act and less decisive once it did so. This could well be due to the massive birdkills in Britain which were wholly or partially attributable to PCBs. By taking the initiative Monsanto avoided a total ban and hung on to one section of a profitable market. While their overall action has been effective and commendable it must be pointed out that prior to its voluntary partial ban Monsanto had refused to cooperate with scientists in the United States who wanted to know total annual production figures and a list of all products containing PCBs. Both requests were unreasonably refused. It is to be hoped that Monsanto will prove more cooperative in the future and that other companies, such as those manufacturing other chlorinated hydrocarbons, learn a lesson from them.

Because of their persistence the combined effects of the hundreds of thousands of tons of chlorinated hydrocarbons already in the marine environment will be felt for years to come. Although world DDT consumption possibly fell by a half between 1964 and 1971 and PCB releases to the environment are probably beginning to fall, there is little room for complacency. If it took us twenty years to discover that PCBs were contaminating the entire world ocean what other compounds have we also missed? When both the supporters and antagonists of DDT compounds make their cases in a largely irrational manner what hope is there for the sane control of chlorinated hydrocarbon pesticides?

68 · MUST THE SEAS DIE?

found to have particularly high concentrations. Like DDT, it has even been found in the milk of Californian mothers.

American investigators have found a correlation between high levels of PCBs in adult sea lions and aborted fetuses. Over 1,000 aborted sea-lion pups were washed up on Californian beaches in 1970 and 1971. Unusually high levels of PCBs were also found in the corpses of over 12,000 sea birds washed up on the western coast of Britain in 1969. There is now good reason to believe that the compounds are involved, together with DDT compounds, in the thinning of shells of sea birds and this alone has led British scientists to press for a ban on the further manufacture of them.

The most insidious discoveries of PCBs in marine organisms were made in the mid-Atlantic. A survey stretching across the entire ocean from the Arctic to the Antarctic and from the Americas to Europe and Africa showed that PCBs were present in practically all specimens collected and usually in higher concentrations than DDT residues. Plants and animals sampled included phytoplankton, zooplankton, sargassum weed, flying fish, dolphins, sharks and tiny fish that migrate daily from the surface to depths of as much as 3,000 feet. The biggest shock was the finding that plankton contained roughly ten times as much PCBs as other marine organisms. This contradicted the theory that compounds usually increase in concentration as one moves up the food chain. Scientists still do not understand what happens to all the PCB that enters the plankton but appears not to enter the organisms that eat them. It could be that plankton with the highest concentrations die or become unacceptable as food for other organisms. If this is the case the entire oceanic ecosystem may be very seriously threatened.

Scientists were so shocked by the Atlantic findings that research should at last be possible to determine what effects PCBs have on plankton and other mid-oceanic forms of life. The little research that has been done on the effects on the behavior and reproductive performance of coastal organisms has led to concern about the effects on humans of PCB residues. It is a prob-

lem that we will be able to study for a long time: PCBs are estimated to have a persistence 100 times greater than that of DDT residues (in other words they will be present in the environment for at least another 500 years). Many developed countries check their foodstuffs for the presence of PCBs and occasionally have to ban food they consider to be too contaminated. In just three months of 1971 the U.S. Food and Drug Administration destroyed 50,000 turkeys, 80,000 chickens and 60,000 eggs. It is known that all the chickens obtained their PCBs from the fishmeal which formed their staple diet.

The control of PCBs has been an even more haphazard affair than the control of DDT compounds. Because of the great variety of uses to which the compounds are put, no attempt has been made to suggest alternative substances to perform the same functions safely. It is still not known how the PCBs in the mid-ocean get there. Working backwards, scientists are becoming increasingly convinced that most of it reaches the seas via the atmosphere—but how does it get into the atmosphere? The most probable source is the burning of paints, varnishes and coatings containing PCBs. Monsanto Chemicals, the sole manufacturer in Great Britain and the United States, has taken the unique step of banning sales in those countries to people who put PCBs to uncontrollable uses (that is, those in which there is a danger that they might escape to the environment through burning or careless application). Even those customers who use the compounds for controllable uses—in sealed systems such as transformers—are urged by the company to exercise the utmost care. Monsanto has even developed a disposal service to collect customers' waste PCBs and destroy them by high pressure incineration. Monsanto also has an agreement with Bayer, the sole German manufacturer, not to sell PCBs for uncontrollable uses in West Germany. The two companies are believed to have a blacklist of companies which might put the chemicals to uncontrollable uses while professing otherwise. Both have also agreed that a disappointed customer from one country will not be served in the other.