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Report to Congressional Committees

June 1999

ENVIRONMENTAL PROTECTION

Coordinated Federal Efforts Are Being Undertaken to Address Harmful Algae

GAO/RCED-99-192

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-282701

June 30, 1999

The Honorable John Mica
Chairman, Subcommittee on Criminal Justice,
Drug Policy, and Human Resources
Committee on Government Reform
House of Representatives

The Honorable Christopher Shays
Chairman, Subcommittee on National Security,
Veterans Affairs, and International Relations
Committee on Government Reform
House of Representatives

Dear Mr. Chairman:

Outbreaks of the toxic algae Pfiesteria in the Chesapeake Bay and in North Carolina estuaries have received national attention. These outbreaks are part of a larger problem of harmful algae that represent a significant and expanding threat to human health and marine resources along the U.S. coastline and around the world. While marine algae are present in all oceans and coastal areas, they become a problem when certain species rapidly multiply, leading to large blooms that can produce toxins.[1]

In light of harmful algae's potential threat, you requested that we (1) discuss the available information on harmful algae and their effects on human health and the environment and (2) describe the status of federal efforts to address the problem of harmful algae, particularly the coordination of research and management strategies among the federal agencies.

Results in Brief

According to the most current research, the toxins produced by harmful algae can affect human health and marine ecosystems in various ways. These toxins—among the most potent chemical compounds known—can kill or injure fish that come in direct contact with them and can accumulate in the tissues of fish and shellfish at levels that are harmful or lethal when ingested by larger fish, sea birds, marine mammals, or humans. Symptoms of algae poisoning in humans are neurological (headaches, dizziness, memory loss, and impairment of motor function); gastrointestinal; and cardiovascular. With respect to marine ecosystems,

[1]For purposes of this report, we use the term "harmful algae" to refer to these blooms.

as the algae outgrow the nutrients available to sustain them, their blooms die, and their decomposition depletes the concentration of dissolved oxygen in the water. The lack of oxygen causes the death of aquatic organisms present in marine ecosystems. Outbreaks of harmful algae appear to be increasing in scope, frequency, and intensity, and their economic impacts are likely to increase.

Federal efforts to protect the public from harmful algae started in 1992 with the National Oceanic and Atmospheric Administration's sponsorship of a workshop for government agencies and other research organizations. This workshop led to the publication of a report entitled Marine Biotoxins and Harmful Algae: A National Plan. Prior to 1992, federal efforts were generally restricted to responding on a case-by-case basis to new outbreaks. The national plan set in place an ongoing interagency process for addressing certain objectives and resulted, in 1996, in the establishment of an interagency coordination program. Under this program, five federal agencies have provided approximately $22 million for basic research projects directed at better understanding the scientific uncertainties associated with harmful algae. Although the initial research projects were funded in 1997, outbreaks of Pfiesteria in the Chesapeake Bay focused national attention on the problem and resulted in the funding of additional projects in 1998. Since most projects are long-term research efforts, significant progress in protecting public health and the environment may be many years away. A scientific panel also recommended, in 1997, the creation of a program to complement basic research efforts by focusing on the coordination of federal efforts to prevent, mitigate, and control harmful algae. After finding that little has been done at the federal level to prevent and control harmful algae, , the Congress enacted the Harmful Algal Bloom and Hypoxia Research and Control Act of 1998 (P.L. 105-383, Nov. 13, 1998), which required the creation of an interagency task force to address the problem.

Background

Over the past 25 years, the observed incidence and intensity of harmful algae have increased substantially. Marine biotoxins and harmful algae have affected coastal ecosystems throughout the United States and the world. Marine algae, which are present in all ocean and coastal areas, are generally benign and form a critical part of the food web. Among the thousands of species of algae, only a few dozen are known to produce toxins or conditions that adversely affect other marine life, wildlife, and humans. Scientists have not identified all the factors that cause some algae species to shift from benign to toxic forms.

When conditions (nutrients, temperature, ocean currents) are favorable, the algae population rapidly increases. Although the reasons for harmful algae in U.S. waters are unclear, some possibilities include natural transportation by tides and currents and the transportation of algae species in ships' ballast water. Available data also indicate that algae increase in areas where there is an abundance of nutrients, such as phosphorus and nitrogen, in the water, and these increases can include increases in harmful species. These nutrients largely result from human activities, such as increases in animal waste because of concentrated animal agriculture, farm and urban runoff, sewage, and other types of pollution. We have previously reported on the impacts of animal waste and other types of nonpoint-source water pollution.[2]

Harmful algae have significant economic impacts, including the costs to federal, state, and local governments for conducting research and monitoring programs and expenditures for the medical treatment of exposed populations. Economic losses are difficult to estimate and fluctuate widely from year to year. While an estimate of the annual economic impacts resulting from harmful algae in the United States is still being developed by the National Oceanic and Atmospheric Administration's (NOAA) National Office for Marine Biotoxins and Harmful Algal Blooms, preliminary analyses indicate an average annual impact of over $42 million for 1987 through 1993. These estimated losses are attributed to reduced harvests of shellfish and fish, reductions in seafood sales, and reductions in tourism-related businesses. Harmful algae can have significant economic impacts on the individual areas affected. In fact, 1997 Pfiesteria outbreaks in the Chesapeake Bay resulted in the collapse of Chesapeake seafood sales and boat charters, causing an estimated $43 million in losses for watermen, seafood dealers, and restaurants. According to the Deputy Director of NOAA's Coastal Ocean Office, harmful algae outbreaks are increasing in scope, frequency, and intensity, and the annual economic impacts are likely to continue to increase.

Harmful Algae Can Adversely Affect Human Health and the Environment

Harmful algae represent a significant and expanding threat to human health and marine environments in the United States. According to the Director of NOAA's National Office for Marine Biotoxins and Harmful Algal Blooms, humans are vulnerable to illness from consuming fish or shellfish contaminated with the toxins produced by harmful algae, or in some cases, from contact with the skin or from inhaling spray from water

[2]See Water Quality: Federal Role in Addressing and Contributing to Nonpoint Source Pollution (GAO/RCED-99-45; Feb. 26, 1999); and Animal Agriculture: Information on Waste Management and Water Quality Issues (GAO/RCED-95-200BR; Jun. 28, 1995).

contaminated with toxins from harmful algae. Large quantities of fish and marine mammals, turtles, and birds that come in direct contact with the toxins produced by harmful algae can be killed or injured. In addition, the algae can alter marine habitats, including degrading aquatic vegetation and phytoplankton[3]. Because aquatic vegetation and phytoplankton are the foundation of the marine food chain, their decline decreases the overall ecological productivity of an affected area.

Impacts on Human Health

NOAA has reported that algae are responsible for significant health problems in the United States and the world. The toxins they produce are among the most potent chemical compounds known. Humans are exposed to these toxins primarily when they consume contaminated seafood. The consumption of a single clam or mussel contaminated with certain algal toxins can be fatal.[4] Some of the more common human illnesses caused by these toxins are discussed below. See figure 1 for the affected areas.

- Paralytic shellfish poisoning is a life threatening illness associated with the consumption of shellfish or certain fish containing a class of algal toxins that affect the neurological system. Symptoms appear shortly after eating the food, and in the most severe cases, respiratory arrest occurs within 24 hours. With medical support, victims usually recover within 12 hours. Large-scale monitoring programs to identify toxin levels in mussels, oysters, scallops, and other shellfish and the rapid closure of harvest areas suspected of containing toxin-infested waters are the methods used to address the problem. All of the coastal New England states and much of the West Coast, from Alaska to California, have been affected.
- Neurotoxic shellfish poisoning affects individuals who eat shellfish that have accumulated a class of algal toxins called brevetoxins. Although there are no reported human deaths from neurotoxic shellfish poisoning, the poisoning causes severe gastrointestinal and neurological symptoms. Also, individuals who come into contact with this toxin through sea spray experience asthma-like symptoms. Beach clean-up efforts and public health advisories are used to manage fish kills and other ecological problems associated with the toxin-producing algae. The states that are most affected include Florida, Louisiana, Mississippi, and Texas.
- Amnesic shellfish poisoning, a sometimes fatal illness, results in a variety of gastrointestinal and neurological disorders, including nausea,

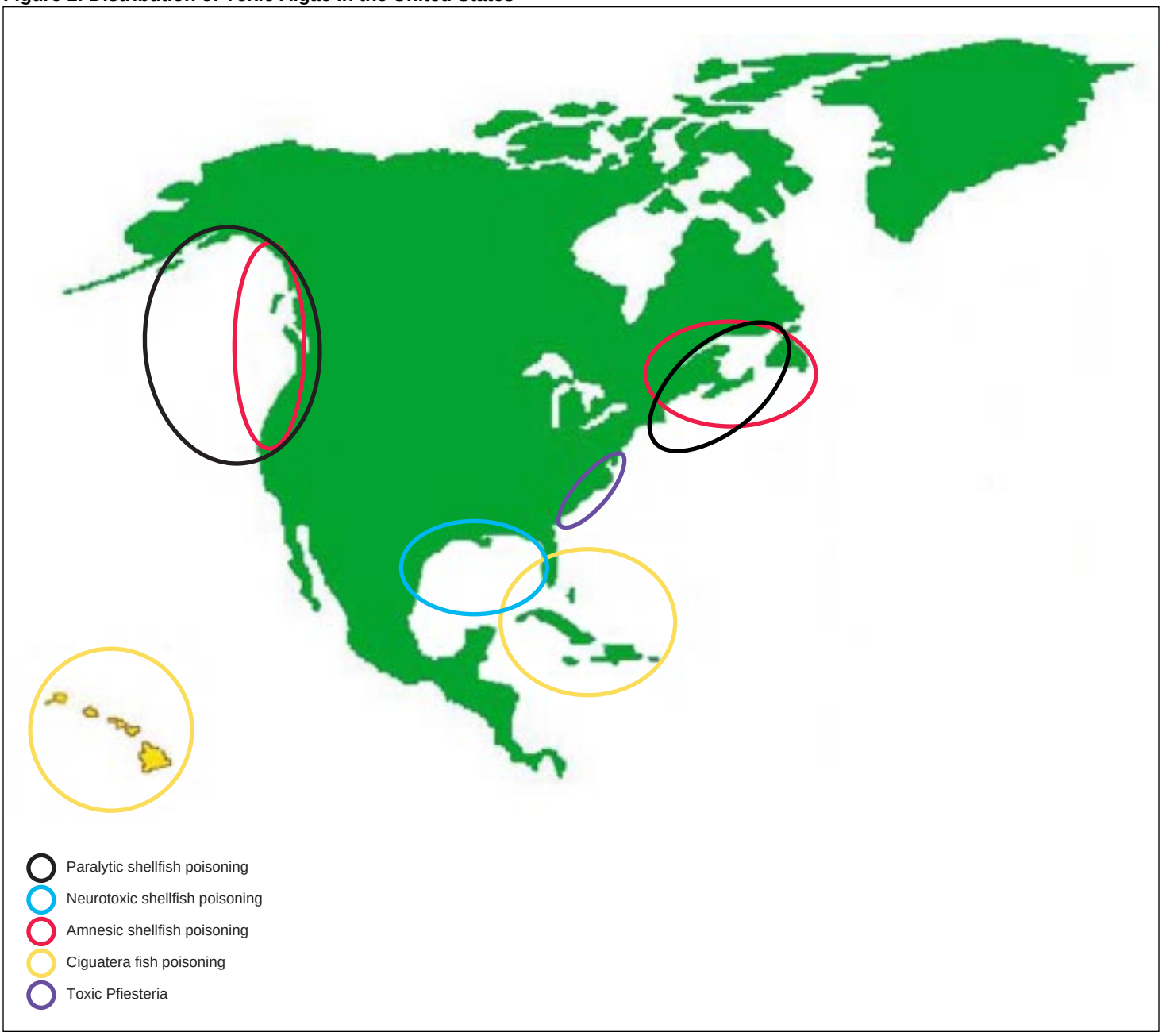
[3]Phytoplankton (small plant organisms) are algae that include harmful species that float or drift in the water.

[4]The Food and Drug Administration provides public information and education on its Seafood Hotline (1-800-332-4010) and web page (www.foodsafety.gov).

abdominal cramps, dizziness, seizures, disorientation, respiratory difficulty, and short-term memory loss. Research has shown that domoic acid, the toxin responsible for amnesic poisoning, accumulates in fish, crabs, and other fisheries resources, and in marine mammals, making it a significant risk to humans. The toxin was first identified in Canada in 1987 and has been detected in shellfish from both the west and east coasts of the United States and in the Gulf of Mexico. Incidents of amnesic shellfish poisonings have increased in recent years.

- Ciguatera fish poisoning is associated with algal toxins called ciguatoxins, which accumulate in tropical fish. Victims experience gastrointestinal, neurological, and cardiovascular symptoms. While incidences of paralysis and death have been documented, the symptoms are usually less severe and will either subside within a few days or continue for several years. Information reported to the Department of Health and Human Services' Centers for Disease Control and Prevention indicates that ciguatera fish poisoning is responsible for about half of all seafood poisonings in the United States. Ciguatera poisoning is estimated to affect up to 50 percent of the people living in tropical and subtropical states and territories, such as the U. S. Virgin Islands.
- Pfiesteria and closely related organisms have been linked to massive fish kills and to living fish with open, bleeding lesions or erratic behavior. Researchers exposed to mist from laboratory tanks containing toxic Pfiesteria experienced severe memory problems and other neurological and pulmonary effects that persisted for months to years. People who have been in contact with affected waterways during a Pfiesteria outbreak have experienced memory loss, headache, skin lesions, and burning sensations on the skin. Pfiesteria and Pfiesteria-like species have been identified in estuaries from Delaware to Florida.

Figure 1: Distribution of Toxic Algae in the United States



Source: National Ocean Service, Center for Coastal Environmental Health and Biomolecular Research.

Effects on Marine Ecosystems

Algal toxins present major ecological threats to marine environments. Different types of harmful algae can affect marine ecosystems. Red tides[5] have been linked to massive fish kills in the Gulf of Mexico. They are found most frequently along Florida's west coast, where they were noted as early as 1844. In the 50 years between 1946 and 1996, 42 red tides were observed along Florida's west coast. During a red tide, it is common to find dead birds and fish. Red tides have also been blamed for the deaths of large numbers of dolphins and manatees, including more than 150 endangered manatees in Florida in 1996. In 1997, an estimated 21 million fish were killed by a red tide off the Texas coast. (See fig. 2.)

[5]The term "red tide" refers to the concentration of algae that colors the water.

Figure 2: Dead Fish From Red Tides on the Florida and Texas Coasts

Dead Fish in Red Tide Off the Florida Coast

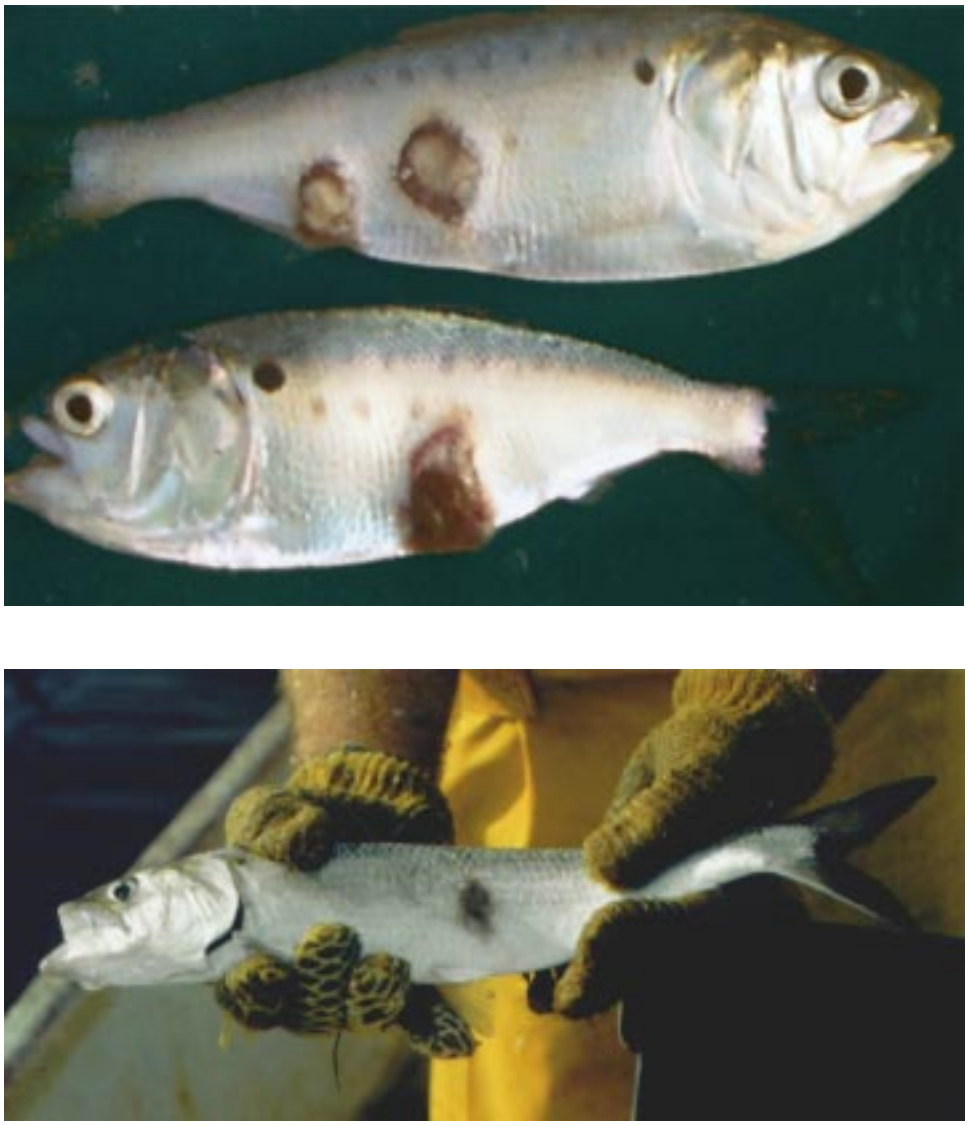
Beached Dead Fish Caused by a Texas Red Tide

Sources: National Office for Marine Biotoxins and Harmful Algal Blooms,Woods Hole Oceanographic Institution and ECOHAB, A National Research Agenda, photo by Brazosports

Pfiesteria has also been implicated in significant environmental events in the coastal waters of the Mid-Atlantic States. The toxins produced by the Pfiesteria organism are believed to have killed more than one billion fish

in the coastal waters of North Carolina and more than 30,000 fish in coastal tributaries in Maryland. Fish exposed to Pfiesteria are stunned and develop sores. (See fig. 3.) Pfiesteria and Pfiesteria-like organisms have been identified in the waters from Delaware to Florida.

Figure 3: Fish Killed by Pfiesteria



Source: Dr. JoAnn Burkholder, Aquatic Botany Laboratory, North Carolina State University.

Even those algae that do not produce toxins can be dangerous to the marine environment. For example, as they use up the nutrients needed to sustain them, the algae die and decompose, depleting dissolved oxygen in the water and causing hypoxia—low oxygen concentrations—and anoxia—no oxygen. Large hypoxic areas, or dead zones, such as the one that forms each year in the northern Gulf of Mexico, result from the death of massive but largely nontoxic harmful algae.

Coordinated Federal Efforts Are Being Undertaken

Coordinated federal efforts to protect the public from harmful algae started in 1992 with a workshop sponsored by the National Oceanic and Atmospheric Administration. This workshop led to the 1993 publication of a report entitled Marine Biotoxins and Harmful Algae: A National Plan. Prior to 1992, federal efforts were generally restricted to responding on a case-by-case basis to new outbreaks of harmful algae. The national plan set in place an ongoing interagency process for addressing the objectives set out in the plan and resulted, in 1996, in the creation of the interagency Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) program.

While the objectives in the national plan (see below) are still current, funding limitations have delayed the start of many of the projects addressing the objectives. For example, the ECOHAB program began funding several large regional projects in 1997. At the same time, however, the outbreaks of Pfiesteria in Maryland during the summer of 1997 tended to focus national attention on the need to take action against harmful algae, and, as a result, additional projects were funded in 1998. Because most of these projects have only recently gotten under way and have multiyear time frames, significant progress in protecting the public from harmful algae is still many years away.

Coordinated Efforts to Learn About and Manage the Effects of Harmful Algae

The 1992 NOAA sponsored workshop brought scientists and regulatory officials together to address the problems of harmful algae. This workshop resulted in the 1993 publication of a national plan—Marine Biotoxins and Harmful Algae: A National Plan—for conducting basic research and developing management and mitigation strategies to protect the public and the environment from problems associated with harmful algae. In the plan, representatives from federal and state government, academia, and industry stated that the U. S. research, monitoring, and regulatory infrastructure is not adequate to meet the expanding threats from harmful algae and established the goal of effectively managing fisheries, public health, and ecosystem problems. According to the plan, the following eight specific

research objectives must be addressed to comprehensively evaluate, model, and manage harmful algae and its impacts:

- isolating algae toxins and characterizing their chemical and pharmacological actions,
- developing tests to identify individual toxins based on their unique chemistry,
- developing the capability to predict the occurrence and assess the impacts of harmful algae.
- determining the source and consequences of algae toxins in the marine food web.
- developing management and mitigation strategies to minimize the impacts of harmful algae,
- identifying and improving access to databases on toxic algae occurrences and impacts.
- developing programs to communicate educational and public health information, and
- providing rapid response programs for harmful algae outbreaks.

The national plan set in place an interagency process for addressing these objectives. A December 1995 report—The Ecology and Oceanography of Harmful Algal Blooms: A National Research Agenda—serves as a blueprint for carrying out the federal research program on the ecology and oceanography of harmful algae. This report resulted in the establishment of the ECOHAB program, the first federally coordinated effort dedicated to conducting the basic research necessary to understand the nature of harmful algae, the reasons they occur, and the steps that can be taken to control them. Under the auspices of the ECOHAB program, five federal agencies—NOAA, the Environmental Protection Agency (EPA), the National Science Foundation (NSF), the Office of Naval Research (ONR), and the National Aeronautics and Space Administration (NASA)—have funded research projects that are carried out in-house or by universities and other organizations. Other agencies, including the Centers for Disease Control and Prevention (CDC), the National Institute of Environmental Health Sciences (NIEHS), and the Food and Drug Administration (FDA) are involved

in conducting research and disseminating information to the public on harmful algae. Research supported by CDC and NIEHS primarily focuses on the human health effects that result from exposure to water or aerosols containing harmful algae, while FDA's research focuses on the human health effects from exposure to toxins from consuming seafood. Collectively, these agencies spent more than $40 million in 1997 and 1998 on these efforts. (See table 1.)

Table 1: ECOHAB and Other Key Agency Funding for Research on Harmful Algae

Research organizations	1997	1998
ECOHAB (NOAA, EPA, NSF, ONR, NASA)[a]	$10,200,000	$11,700,000
CDC	$0	$7,000,000
National Institute of Environmental Health Sciences	$975,000	$2,400,000
Food and Drug Administration	$4,200,000	$4,200,000
Total	$15,400,000	$25,300,000

[a]These amounts represent the total funding for multiyear projects.

Before the ECOHAB program, research on the effects of harmful algae was typically isolated and uncoordinated. Often, the research was carried out by individual scientists and was not sustained over time. Before the program, there was essentially no overall federal coordination of the work to ensure that important national priorities were being addressed.

A second report was issued in February 1997. Developed on the basis of the objectives in the national plan, Harmful Algal Blooms in Coastal Waters: Options for Prevention, Control and Mitigation describes the processes and mechanisms that need to be employed to control harmful algae and their impacts. According to NOAA officials, this report is the basis for new initiatives for intervention strategies to deal with harmful algae to minimize human health, ecological, and economic impacts.

The National Harmful Algal Bloom Research and Monitoring Strategy, published in November 1997, presents a national strategy for federally-supported research and monitoring for problems associated with harmful algae, particularly Pfiesteria and Pfiesteria-like organisms. The report is intended to serve as an action plan for Pfiesteria research and monitoring within the framework of the broader objectives identified in the national plan. In November 1998, NOAA published The Status of U.S.

Harmful Algal Blooms: Progress Towards a National Program, which described a number of interagency programs designed to understand and ameliorate the impacts of harmful algae without attempting to provide a quantitative assessment of progress.

Addressing Harmful Algae Problems Is a Long-Term Process

Research on harmful algae is generally long-term. Most ECOHAB-sponsored research projects are just getting under way, including two 5-year multidisciplinary programs to study toxic algal blooms in the Gulfs of Maine and of Mexico. Some delays have been encountered. According to NOAA officials and several key researchers, there has been a significant delay in identifying the chemical composition of the Pfiesteria toxins. They stated that researchers cannot get enough Pfiesteria toxins to characterize their chemical and molecular structure. Massive amounts of tiny algal cells must be isolated in pure laboratory cultures to produce enough toxins for the analyses. Thus far, the Aquatic Botany Laboratory at North Carolina State University has been the only facility able to provide significant quantities of toxic Pfiesteria cultures to the scientific community. According to the laboratory director, funding limitations have precluded the facility from producing sufficient quantities of the toxins for identification and characterization. Until toxin supplies for Pfiesteria and other harmful algae are increased and the chemical analyses are completed, other important research objectives, such as developing management and mitigation strategies to minimize the impact on human health and the environment, are unlikely to be achieved.

Recognizing that many of ECOHAB's research projects represent long term efforts and are primarily directed to resolving scientific uncertainties, a 1997 scientific panel recommended the creation of a federal program that would complement the ECOHAB program by focusing on the prevention, mitigation, and control of harmful algae. While NOAA, EPA, and other federal agencies have conducted or supported efforts in this area, the efforts have generally been carried out in a piecemeal manner, as basic research was done before the ECOHAB program. For example, after the 1997 outbreak of Pfiesteria in Maryland and Virginia, the administration created an ad hoc interagency task force to assist the states in preventing, mitigating, and controlling Pfiesteria. Similar efforts for other harmful algal species, however, have not been established, and, in September 1998, the Senate Committee on Commerce, Science, and Transportation reported that little had been done at the federal level to prevent and control harmful algae given the scope and seriousness of the problem.

The Congress Has Mandated an Interagency Effort on Harmful Algae Toxins

In November 1998, the Congress enacted the Harmful Algal Bloom and Hypoxia Research and Control Act of 1998, which is focused on federal prevention, mitigation, and control efforts. The act requires the establishment of an interagency task force on harmful algal blooms and hypoxia. Task force members include representatives of NOAA (serving as chair), EPA, the National Science Foundation, the Food and Drug Administration, the National Aeronautics and Space Administration, the Office of Science and Technology Policy, the Council on Environmental Quality, and the departments of Agriculture, Interior, Navy, and Health and Human Services. Among other things, the task force is required to complete an assessment of the ecological and economic consequences of harmful algae; develop alternatives for reducing, mitigating, and controlling the outbreaks of blooms; and examining the social and economic costs and benefits of such alternatives. In addition, the assessment should identify alternatives for preventing unnecessary duplication of effort among federal agencies and departments and provide for federal assistance to the states and local governments in preventing, reducing, managing, mitigating, and controlling harmful algae and its public health and environmental impacts. The assessment is to be submitted to the Congress by November 13, 1999.

Agency Comments

We provided a draft of this report to NOAA and EPA for their review and comment since they are the lead agencies for coordinating federal efforts to address the problems of harmful algae. The agencies generally agreed that the report accurately describes what is known about the effects of harmful algae on human health and the environment and the federal efforts to address the problem.

In commenting on the report, NOAA stated that it is committed to reducing the impacts of harmful algae on U.S. coastal resources, economies, and public health. NOAA also made a number of specific technical suggestions, which we incorporated into the report as appropriate.

EPA said that the report provided an accurate and informative summary of the issues. EPA also made several observations about the report. First, EPA stated the draft did not address the problem of mitigating and controlling harmful algae and pointed out that while the Ecology and Oceanography of Harmful Algal Blooms program is doing research on the impacts of harmful algae, it is not addressing current efforts to mitigate the problem. The draft report discussed mitigation efforts, including information on the interagency task force created by the Harmful Algal Bloom and Hypoxia

Research and Control Act of 1998. The task force is intended to complement the Ecology and Oceanography of Harmful Algal Blooms program by coordinating federal efforts to control and mitigate harmful algae. Second, EPA pointed out that Pfiesteria is only one of the toxin-producing organisms requiring research and suggested that the report describe the Ecology and Oceangraphy of Harmful Algal Blooms projects and the level of funding provided by the contributing agencies. The report clearly states that although Pfiesteria outbreaks have received recent attention, the newly created interagency task force is to address alternatives for reducing, mitigating, and controlling all harmful algae that have the potential for affecting human health and the environment. Furthermore, the report provides summary research and funding information. Third, EPA indicated that it would be useful to include information on the ability to detect contaminated seafood before it is made available to consumers. We agree and added information on FDA's seafood hotline and web site. See appendixes I and II, respectively, for the text of NOAA's and EPA's comments.

Scope and Methodology

To identify available information on harmful algae and their effects on human health and the environment, we held discussions with managers and researchers from the two lead federal agencies for the ECOHAB program—NOAA and EPA—which have also assumed the leadership role for supporting research on the factors responsible for harmful algae and for developing models for predicting future outbreaks. We also interviewed officials from the Centers for Disease Control and Prevention, the National Institute of Environmental Health Sciences, and the Food and Drug Administration to discuss their research findings on the human health implications of exposure to algae toxins. We also talked with nationally recognized experts from academia and other organizations involved in research on harmful algae and attended technical conferences at which scientific information on the causes and impacts of harmful algae were presented. We reviewed the national plan for addressing the harmful algae problem and other scientific studies that contain extensive information on the human health and environmental effects associated with harmful algae.

To describe the status of federal efforts to address the problem of harmful algae, particularly the coordination of research and management strategies among the federal agencies, we interviewed managers and researchers from the two lead federal agencies for the ECOHAB program, an interagency coordination program established to address the scientific uncertainties

associated with harmful algae. We interviewed officials from the Centers for Disease Control and Prevention, the National Institute of Environmental Health Sciences, and the Food and Drug Administration to discuss the status of their research on the human health implications from exposure to algal toxins. We also talked with nationally recognized experts from academia and other organizations involved in research on harmful algae and attended technical conferences at which information on the status of research on the causes and impacts of harmful algae and the progress in developing management and mitigation strategies was presented. We also reviewed NOAA's recent report on the status of progress towards developing a national harmful algae program and other studies that address the status and coordination of research on harmful algae.

We performed our work from August 1998 through June 1999 in accordance with generally accepted government auditing standards.

As arranged with your offices, unless you announce its contents earlier, we plan no further distribution of this report until 15 days from the date of this letter. At that time, we will send copies of this report to Senator John McCain, Senator Ernest F. Hollings, Senator Olympia J. Snowe, Senator John F. Kerry, Senator John H. Chafee, Senator Max Baucus, Senator Jesse Helms, Representative Dan Burton, Representative Henry A. Waxman, Representative Patsy T. Mink, Representative Rod R. Blagojevich, and other interested members of Congress. We will also send copies of this report to the Honorable Carol Browner, Administrator, Environmental Protection Agency; the Honorable Dr. Jeffrey Koplan, Director of the Centers for Disease Control and Prevention; the Honorable Dr. D. James Baker, Administrator, National Oceanic and Atmospheric Administration; the Honorable Dr. Kenneth Olden, Director, the National Institute of Environmental Health Sciences; and the Honorable Dr. Jane E. Henney, Commissioner, Food and Drug Administration. We will also make copies available to others on request.

Please call me at (202) 512-6111 if you or your staff have any questions about this report. Major contributors to this report are listed in appendix III.

David G. Wood

David G. Wood
Associate Director,
Environmental Protection Issues

Contents

Abbreviations

CDC	Centers for Disease Control and Prevention
ECOHAB	Ecology and Oceangraphy of Harmful Algal Blooms
EPA	Environmental Protection Agency
FDA	Food and Drug Administration
NIEHS	National Institute of Environmental Health Sciences
NSF	National Science Foundation
NOAA	National Oceanic and Atmospheric Administration
ONR	Office of Naval Research

Comments From the Department of Commerce

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
CHIEF FINANCIAL OFFICER/CHIEF ADMINISTRATIVE OFFICER

JUN 1 1999

Mr. David G. Wood
Associate Director, Environmental
Protection Issues Resources, Community,
and Economic Development Division
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Wood:

Thank you for the opportunity to review the General Accounting Office report entitled "Environmental Protection: Coordinated Efforts Are Being Undertaken to Address Harmful Algal Bloom", GAO/RCED-99-192. Enclosed are the National Oceanic and Atmospheric Administration's comments to this draft report.

These comments are prepared in accordance with Office of Management and Budget Circular A-50.

Sincerely,

Paul F. Roberts

Enclosures

Comments From the Environmental Protection Agency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 4 1999

OFFICE OF
RESEARCH AND DEVELOPMENT

Mr. David G. Wood
Associate Director, Environmental Protection Issues
Resources, Community and Economic Development Division
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Wood:

Thank you for the opportunity to comment on the draft report entitled, *Environmental Protection: Coordinated Federal Efforts Are Being Undertaken to Address Harmful Algal Blooms* (GAO/RCED-99-192), received on May 21, 1999.

In general, we find the draft report to be an accurate and informative summary of the issues. We have a number of general observations which, if addressed in the final report, may be helpful to the overall message of the report. Also, we have more detailed comments which are geared to sharpen the quality and accuracy of the report. These detailed comments are enclosed.

We observed that the draft report does not address an important aspect of the harmful algal blooms (HABs) problem, the mitigation and control of HABs. A great deal of research has been done by programs like the interagency Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) program to address the impacts of HABs, but little has been done to mitigate the problem.

Although recent attention has been focused on outbreaks of *Pfiesteria* and *Pfiesteria*-like organisms, *Pfiesteria* is only one of many toxin-producing marine organisms potentially damaging to human and ecological health. It would be useful to clearly state that research is greatly needed on other major identified harmful algae to characterize the health risks, identify triggers for blooms, and methods for controlling their blooms. It would also be useful for the report to include information on the ability, or lack thereof, to detect contaminated seafood before it is made available to consumers. Also, we suggest that the report include: (1) a short description of the type of research that ECOHAB supports, and (2) summarized

short descriptions of the contributing agencies' own HAB research programs. These additions would balance the report's message with positive efforts that are underway at the federal level.

Thank you again for the opportunity to respond to this draft report. Should you have any questions or need additional information, I can be reached at 202-564-6620.

Sincerely,

Norine E. Noonan

Norine E. Noonan, Ph.D.
Assistant Administrator

Enclosure

GAO Contacts and Staff Acknowledgements

GAO Contacts

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William F. McGee (919) 899-3781

Acknowledgements

In addition to those named above, Harry C. Everett, Kellie O. Schachle, Everett O. Pace, Richard A. Frankel, and Karen K. Keegan made key contributions to this report.

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