

Exaggerating Environmental Health Risk: The Case of the Toxic Dinoflagellate Pfiesteria

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Despite mounting evidence that *Pfiesteria picicida*, a marine organism that releases a neurotoxin, poses no serious threat to public health, its threat continues to be exaggerated by journalists, popular writers, politicians, and scientists. After presenting evidence against the public health threat that the organism poses, the author discusses four reasons that such evidence was initially questioned, rejected and vehemently opposed by journalists, politicians, and scientists engaged in research on *Pfiesteria*. The argument contains several implications for past and current trends in anthropological research, analysis, and reporting.

Key words: environmental health, media, risk analysis, water quality, mid-Atlantic

Before focusing on one link in a chain of possible causation, scientists first try to establish a connection between one end of the chain and the other—that is, between the suspected cause and the disease. For example, first we found out that cigarette smoking is associated with lung cancer. Only then did scientists turn their attention to how cigarettes might cause the disease.... In the breast implant controversy, there has been a tendency to do it backwards. Assuming there is a connection, some people have sought to explain how it works. This backwards approach does not invalidate the observations, of course. But it is an inefficient way to address a problem, and it raises the question of bias (Angell 1995:108).

As the end of the Millennium approaches, we are likely to hear ever more doomsday prophesy: people seem susceptible to the idea that the end of a thousand

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recorded years will be marked by floods, quakes, droughts, eruptions, and plagues. It is difficult to estimate the influence of this hysteria on daily life. We have AIDS to remind us that new plagues are possible and natural disasters enough to keep funds flowing to evangelists' crusades. In short, we witness enough from sources we consider (fairly) reliable to give credence to imminent disasters with little solid evidence.

Over the past few years, several popular accounts have presented evidence of new potential threats to public health. Some of these inspired motion pictures and other dramatized accounts that reinforce key doomsday themes presented in the books. Well-known examples of this include Randy Shilts's *And the Band Played On* (1987), an early account of the AIDS epidemic, and Richard Preston's *The Hot Zone* (1994), an account of deadly rainforest illnesses. HBO made Shilts's book into a movie, and on the heels of Preston's book came *Outbreak*, a motion picture about the government response to a town infected with a deadly disease by a smuggled monkey.

Often the evidence presented in the nonfictional accounts is primarily anecdotal, based on a few well-described, dramatic cases that journalists or popular writers embellish with hyperbole and speculation. Similar to Randy Shilts's history of the discovery and lackluster government response to AIDS, these accounts often develop the corollary theme of government or corporate conspiracy. This deepens the threat to public health with the suggestion that the health care system has abdicated its responsibility or has become so incompetent that we can no longer trust it to heal and protect us. Shilts himself suggests, for example, that the government moved slowly against AIDS during the Reagan years because of an evil desire to wipe out the U.S. gay population. In a more

recent work, Richard Rhodes (1997) claims that the British government denied any threat to public health from mad cow disease, quoting a woman who claimed government officials told her to keep her illness from tainted beef quiet for the good of the nation's farming community.

Here I discuss a recent case where a small group of scientists warned of a serious threat to public health from a marine dinoflagellate known as *Pfiesteria piscicida*. On September 25, 1997, concern about the organism stimulated a congressional hearing. The hearing followed a fish kill on Maryland's Pocomoke River, near the Chesapeake Bay (and Washington D.C.), an incident that renewed controversy surrounding the dinoflagellate.¹ This one-celled organism releases a neurotoxin believed to have caused temporary memory loss in laboratory technicians and mild cognitive impairment in individuals exposed to fish kills (Grattan et al. 1998; Smith and Music 1998). Yet, since it was identified in North Carolina in 1991, *Pfiesteria* has been implicated in the sickness of fewer than 100 people among the millions who fish, sail, swim, and otherwise work and play in the waters of Eastern North Carolina and the Chesapeake Bay during the very times of year when the cell is most active. No one has died from *Pfiesteria*, and the few individuals who have suffered from contact with the organism have recovered fully, usually within a few hours or days, suggesting that *Pfiesteria* is on par with other well-known marine irritants such as ciguatera, a coral-reef neurotoxin, or the better-known red tide (Grattan et al. 1998; Smith and Music 1998). A recent study by a medical team at the University of North Carolina found that a handful of people who claimed to have suffered from exposure to *Pfiesteria* suffered no long-term health problems that could be attributed to exposure (Schiffer and Clabby 1998; Swinker 1998; Smith and Music 1998). In short, one's chances of being stricken by *Pfiesteria* are far lower than one's chances of being stung by a jellyfish, startled by a stingray, or attacked by a shark.

Despite low health risks associated with *Pfiesteria*, already millions in funds have been allocated to isolate *Pfiesteria's* toxin, determine its effects on lab rats, map its distribution, and estimate its threat to public health. The findings presented here derive from early funds allocated out of fear about *Pfiesteria's* potential for harm (Griffith et al. 1998).² Additional funding has continued to the present day, despite growing evidence that *Pfiesteria* poses low health risks to humans and far less risk than other, more dangerous marine organisms such as *Vibrio vulnificus*, a marine bacteria that contaminates seafood and results in several human fatalities every year (Barnet 1997; Burke 1997; McClellan-Green, Jaykus, and Green 1998; Morris et al. 1991; Paerl and Pinckney 1998).

While *Pfiesteria* has been implicated in both human illness and fish kills (Grattan et al. 1998), the public response to *Pfiesteria*, particularly by the political and media establishments, has been to insist that North Carolina state health officials divert public funds and staff away from known deadly public health hazards for *Pfiesteria* research (Music,

n.d.). Reaction to the dinoflagellate in Maryland has taken a slightly different course, focusing less on threats to public health and more on environmental threats to water quality that stem from agricultural run-off. In both states, however, fears about the potential risks from *Pfiesteria* spread far in advance of our knowledge about the true depth of its threat. This article discusses several probable reasons why *Pfiesteria* has received a disproportionate amount of media attention and public funding relative to other potential health threats, as well as why many scientists and environmentalists continue to ignore, discount, or accuse of being part of a government cover-up, those studies that question the fact that *Pfiesteria* poses a serious threat to public health.

Background: The Making of a Monster

Marcia Angell (1995) describes how several physicians concluded that breast implants posed threats to their recipients by putting the research cart before the horse. Determining that implants made some women ill, physicians alerted the tort law community of the possibility of a product liability suit against Dow Corning. Lawyers based in San Francisco traveled to Dow Corning to pour over internal memos and documents that, they later argued in court, revealed that the company knew breast implants were potentially hazardous. Citing a particularly damaging memo, they also argued that Dow Corning conspired to trick physicians into thinking implants were less prone to leakage than they were. Without the benefit of epidemiological studies, lawyers began winning multimillion dollar settlements against Dow Corning, driving them into bankruptcy, and David Kessler, head of the Food and Drug Administration, banned silicon breast implants, further fueling the fires of litigation (Angell 1995).

In an almost identical fashion, the authors of the idea that the toxic dinoflagellate known as *Pfiesteria* posed a serious threat to public health came to their conclusions after they experienced sickness because of exposure in a laboratory, working with high concentrations of the dinoflagellate in a confined setting.³ Although no epidemiological and only preliminary medical studies had been completed prior 1997, as early as 1994, scientists who worked with *Pfiesteria* began making and embellishing claims that it posed a serious threat to public and environmental health. These conclusions were based primarily on anecdotal evidence from a handful of self-selected, self-diagnosed individuals who claimed to have been afflicted by the dinoflagellate. Several newspaper articles, television broadcasts, a sensational book, and speaking engagements and articles of scientists succeeded in convincing environmentalists and the general public that *Pfiesteria* posed a threat of Ebola-like proportions to the people of North Carolina and other parts of the Mid-Atlantic coast (Barker 1997; Burkholder et al. 1992; Clabby 1997; Ford 1997; Jones 1995). Particularly vocal were leaders of environmental groups and journalists from coastal newspapers, some of whom took it upon themselves, in the absence of medical training, to diagnose cases of what came to be

known as *Pfiesteriosis*. With few exceptions, these cases were dismissed as skin ailments such as chigger bites or neurological problems such as Gray's disease (Morris 1991; Burke 1997). A later study in Maryland found that individuals exposed to waters containing *Pfiesteria* have suffered from mild cognitive impairment, yet fully recovered "within 3-6 months after cessation of exposure to affected waters" (Grattan et al. 1998:537; cf. Smith and Music 1998)

The same scientists who introduced the idea of *Pfiesteria* as a threat to public and environmental health simultaneously claimed that North Carolina state officials were covering up this threat. This laid the basis for widespread press coverage, heated responses by environmental groups, and the publication of a popular book similar to those cited earlier (Barker 1997).⁴ In the coverage by North Carolina newspapers and in the popular book, key evidence for a conspiracy theory was the peer-review process for grant proposals submitted to study *Pfiesteria* (Barker 1997; Jones 1995; Leavenworth 1995; Nolan 1997; Ready 1997). This common scientific review process was portrayed as a way the state could stall investigation into the potential threat. According to one report, for example: "In July of 1994, the Department of Environment, Health, and Natural Resources told Burkholder (Jo Ann Burkholder, the principal scientist to promote the idea that *Pfiesteria* posed a serious threat to public health) that it would distribute funds for the research project through Sea Grant. Burkholder protested that that would result in needless delays, and alleged in a letter to Gov. Jim Hunt that the Division of Environmental Management was trying to sabotage her research" (Associated Press 1996).

Perceiving this as an issue of interest to voters, several politicians, including the governors of North Carolina and Maryland, supported the idea that *Pfiesteria* posed a public health threat and gave further credence to claims that powerful members of the state bureaucracy and the scientific community had conspired to conceal the true extent of *Pfiesteria*'s threat. It was into this turbulent setting that results concerning the health of North Carolina watermen were released and, predictably, vehemently questioned, criticized, and eventually dismissed by scientists benefiting from *Pfiesteria* research dollars, environmental groups, and the popular media. These findings were not taken seriously until 1998, after medical researchers began reporting that long-term health problems from *Pfiesteria* were doubtful and after yet another year in which no one had become seriously ill from the dinoflagellate (Smith and Music 1998; Swinker 1998).

Epidemiological Evidence Against a Serious Risk to Public Health

The epidemiological study elicited data about the reported health of watermen fishing in regions affected by fish kills associated with toxic dinoflagellates, including *Pfiesteria piscicida* (Griffith et al. 1998). In 1996, researchers surveyed a target population of 253 crabbers who worked in waters known to host dinoflagellates, here called the Pamlico crab-

bers, and compared their responses to questions about their recent health to two control populations: 1) 115 crabbers who work in the Albemarle and Currituck Sounds, the Alligator River, and northern sections of the Pamlico Sound, here called the Albemarle crabbers; and 2) 125 nonfishing residents of the communities of the crabbers, here called the community controls. The first two groups were randomly selected from state fishing license lists; the third randomly selected from neighborhoods of the Pamlico crabbers.

The team also collected detailed data on crabbing territories for 295 of the 368 crabbers interviewed, comparing these data to maps of fish kills provided by the state of North Carolina, various scientists in North Carolina, and the National Marine Fisheries Service Health Ecological and Economic Dimensions (HEED) Project (Epstein et al. 1997; North Carolina Department of Environment, Health, and Natural Resources 1988-97). The team paid particular attention to those areas where toxic dinoflagellates were associated with fish kills. These territorial data allowed closer analysis of the incidence of illness among crabbers in areas known to have hosted fish kills which are highly correlated with *Pfiesteria*-like dinoflagellates, as well as areas that have suffered repeated fish kills without specific dinoflagellates having been identified. Members of the research team accompanied crabbers on their vessels to determine the extent of crabbers' exposure to the water during a typical workday. Finally, several interviews were conducted with health providers, coastal residents, individuals believed to have been afflicted with various sicknesses due to contact with the water, and others informed about the potential health threats associated with *Pfiesteria*-like organisms.

Findings

The Pamlico crabbers, Albemarle crabbers, and community controls were extremely similar in their demographic characteristics (e.g., age, marital status), their lengths of residence in coastal North Carolina, other characteristics that might influence their health (e.g., alcohol, tobacco, and drug use), and their relationships with the medical community (Griffith et al. 1998). Comparisons among the three populations, as presented in the following table, show that, in most cases, the two groups of crabbers and the community controls report similar levels of illness and injury. Survey data show that all three groups suffered from relatively high incidences (between one-quarter and one-third of each population) of allergies and related respiratory ailments. With one exception, the three populations were similar in the incidence of illness. The one exception to this was that both groups of crabbers reported higher incidences of skin disorders than the community controls. However, comparing the Pamlico crabbers with the Albemarle crabbers, both groups report nearly identical levels of skin disorders. Close analysis of the specific types of skin disorders found that around one-third of these had been diagnosed as skin cancers, and those physicians who have experience treating fishermen reported

Table 1. Percent Who Reported Symptoms: Crabbers and Community Controls Compared

Symptom	Com. Controls	All Crabbers	Pamlico	Albemarle
Personality or memory changes	9.6	7.3	7.9	5.3
Problems with nerves, etc.	5.6	7.0	7.5	6.2
Headaches, seizures, etc.	8.8	14.1	12.6	16.8
Respiratory problems*	24.8	23.7	19.4	35.4
Dermatological problems*	11.2	24.6	25.3	23.0
Digestion, stomach problems	8.0	9.3	9.5	9.7
Heart, circulation problems	20.0	16.1	17.0	15.8
Urination, bladder problems	4.0	7.0	7.1	6.2
Felt unwell, fatigued	6.4	6.5	8.3	3.5
Problems with physical activities	8.0	5.9	7.5	3.5

* = statistically significant $\leq .05$; chi-square analysis

that most skin problems associated with fishing are either skin cancers or are secondary infections caused by failing to treat a puncture wound. This suggests that skin disorders are a common occupational hazard among crabbers and cannot be attributed to the presence of *Pfiesteria* or similar dinoflagellates.

These findings were further confirmed with two additional steps in the analysis: 1) examinations of the relationship between levels of exposure to the water and incidence of illness; and 2) examinations of fish-kill data in conjunction with data on crabbing territories. First, increased exposure to water (as measured by the numbers of traps watermen pull per day) does not result in increased incidence of illness. Second, among crabbers who fish in regions that have been affected by fish kills, far greater percentages reported no ill-health effects than those who reported sickness. Chi-square analysis shows that, with one exception, there are no statistical differences in levels of illness between those who fish in areas that have experienced many fish kills and those who fish in areas with few or no fish kills. The single exception was that slightly more crabbers reported fatigue in fish-kill areas than in non-fish-kill areas. On closer inspection of the cases of fatigue in fish-kill areas, however, the reasons given for fatigue were either overwork or were related to other illnesses such as heart trouble or diabetes; they were not, therefore, related to water quality.

In addition, the data on crabbing territories show the two crabbing populations to be distributed throughout the Albemarle Pamlico Estuarine System, including areas that have experienced large fish kills in recent years. In all cases, well individuals outnumber ill individuals by ratios of between 5:1 and 9:1. A ranking of areas in terms of ratios of well to ill crabbers, however, does show that the areas known to have experienced fish kills—the Neuse River, the Pamlico River, and Pungo River—do have lower well-to-ill ratios than those less prone to experience fish kills, 5:1 as opposed to

9:1 in other areas such as the Pamlico Sound. This may be some cause for concern regarding the impacts on human health of these areas as opposed to others, although even in the highest risk areas we found five well individuals for each individual who reported sickness. Despite this note of caution, these findings suggest that there are extremely low health risks associated with casual contact with the waters of Eastern North Carolina under normal ecological conditions: that is, in the absence of fish kills, algae blooms, red tides, or other readily perceptible indicators of poor water quality.

The Cultural Appeal of Exaggerating Environmental Health Risk

Given these findings, why did the claims of a serious risk to public health continue? More importantly, why has much of the evidence against a health threat not only been dismissed or dealt with lightly, but vehemently resisted by many of the scientists involved with *Pfiesteria* research, journalists, politicians, and environmentalists? I argue that there are four reasons for the continued attention devoted to *Pfiesteria* as a severe environmental threat: 1) the inherent weaknesses of survey research; 2) the ways in which *Pfiesteria* has been portrayed in the popular and scientific literature, including the privileged position enjoyed by anecdotal evidence in journalism and politics; 3) how individuals living along the coast conceptualize environmental risk; and 4) the ethnic and class affiliations, and voting powers, of people who own property along the waterways that experienced *Pfiesteria*-related fish kills.

Each of these reasons allowed those with vested interests in the *Pfiesteria*-as-health-risk hypothesis to dismiss evidence that a serious health risk did not exist. In addition, each of these reasons has wider implications for social scientific inquiry in general and anthropological inquiry and reporting in particular. I discuss these in turn.

Weaknesses of Survey Research

The findings of the epidemiological study were relatively easy to dismiss by those with vested interests in *Pfiesteria* because of inherent problems and sources of bias with survey data. There are at least three problems with these types of data. First, they are self-reported, without the backing of clinical work such as blood or hypertension tests, allowing respondents either to overestimate or underestimate their health problems. Second, these are retrospective data, based on crabbers' abilities to recall recent incidents of illness even if they did not visit health providers. Respondents may forget relatively mild afflictions. Third, those already severely afflicted by illness may have been too ill for an interview.

Two additional problems stemmed from the nature of the population under study. First, individuals may have had a vested interest in lying to researchers, because high reported incidences of illness might have led to restrictions on fishing. Second, given long-term contact with the waters of Eastern North Carolina, watermen may have learned to avoid conditions of poor water quality and, thus, are likely to avoid algae blooms and other indications of *Pfiesteria*.

Informants lying to researchers and informants being poor judges of their own health were the primary issues utilized to criticize this evidence of low risk. Because anthropologists have long argued that survey research suffers from validity and reliability problems (Pelto and Pelto 1976; Bernard 1994), the research team, which included two anthropologists, anticipated and attempted to compensate for these weaknesses. While these problems can rarely be completely solved, they can be effectively addressed by nesting one's study in long-term fieldwork and the broader social context from which survey data emerge. Researchers took pains to accomplish this by relying, first, on researchers and research assistants who had already established some rapport with this population, having acquired several years of field research experience in the context of previous studies of North Carolina fishing and coastal communities (Griffith, n.d.).

Regarding the issue of watermen being too ill to be interviewed, researchers addressed this in two ways: 1) through interviews with coastal health providers to determine their knowledge of watermen and illness; and 2) by examining survey data, in conjunction with other data on North Carolina fishing populations in terms of demographic characteristics that might suggest a skewed sample (e.g., Griffith, n.d.). Neither step suggested large numbers of watermen had died out of the sampling universe.

Finally, regarding the water quality question, previous studies show that watermen know well and avoid what they refer to as "dead water" (water with low levels of oxygen where fish have difficulty surviving), and that they are experts on water quality in many other respects (Griffith, n.d.). Given the research goal of assessing the effects of contact with the waters of Eastern North Carolina under normal ecological conditions (specifically in the absence of fish kills), however, this was not a problem for the study.

Portrayals of *Pfiesteria*

A second source of resistance to findings that *Pfiesteria* did not pose a serious health threat was how the organism had been characterized, first in scientific literature and later in the popular media. From the beginning, scientists working with the dinoflagellate called it an "ambush-predator," describing its behavior in terms that seem more appropriate to military history than biology. In one publication, for example, scientists stated that: "During feeding, 'ambush-predator' dinoflagellates chemically detect and swim toward the prey in what appears to be a directed attack" (Burkholder and Glasgow 1997:200, emphasis mine). In addition to "ambush," scientists used words such as "phantom" and "insidious" to describe the organism, and words such as "gorge" to describe its feeding behavior (Burkholder et al. 1992; Burkholder, Glasgow, and Steidinger 1994; Glasgow et al. 1995; Sprinter, Burkholder, and Glasgow 1996).

Popular media further embellished these descriptions by dubbing *Pfiesteria* "the cell from hell"⁵ and endowing it with the power to kill humans, something which it has yet to accomplish (Shiffer and Clabby 1998; Hager and Reibsten 1997; Grant and Swartz 1997). In the *Raleigh News and Observer*, as well as on several local television news broadcasts, a fisherman suffering from an unidentified affliction claimed to be the latest victim of *Pfiesteria* and became, in the process, the organism's poster child. In the popular book, Barker (1997) dubbed it "the ultimate biological threat," and early promotional materials from Simon and Schuster, the book's publisher, made the statement that the state of North Carolina took an active interest in the organism "only after people began dying."

Medical anthropologists have shown that the ways in which people describe and conceive of the raw materials of medical science—illness, disease, bodies, cells, biological processes, and the like—influence how they are likely to respond to health news (e.g., Balslem 1991). In the case of breast cancer, Mathews, Lannin, and Mitchell (1994), Abarno (1997), and Chavez (1995) have determined that disease theories influence how women engage the health industry. Even after being diagnosed with advanced stages of the disease, some women resist treatment. If conceptions of a known killer can influence some to ignore it, surely a view of *Pfiesteria* as an 'ultimate biological threat' became possible through the ways in which first scientists and then reporters wrote about, and the public read about, this organism.

In addition to how both scientists and journalists characterized the organism itself, the powers of the organism were packaged in equally compelling ways, using a form of discourse that has achieved a privileged position in journalism and political discourse over the past 15 to 20 years: the anecdote. "And the Waters Turned to Blood" opens with an account of a New Jersey family who visited North Carolina on vacation, waded into a fish kill and, later, began suffering from health problems that were vague and unfamiliar to New Jersey physicians and ignored or denied by North Carolina

state health officials. And the personal experiences of the laboratory staff who suffered a variety of symptoms after working with *Pfiesteria* were given wide coverage in the newspapers and in Barker's account. One lab technician's problems ranged from mild irritability and disorientation to bursts of rage and memory loss. In a widely publicized incident, he woke during the night, screamed savagely at his wife for failing to coil the vacuum cleaner's cord properly, and then had no recollection of the incident in the morning (Burkholder et al. 1992; Burkholder 1998). During this same time period, anecdotal evidence supporting the health-threat hypothesis was accumulating outside laboratory settings as well. One of the main monitors of the Neuse River, an active environmentalist, began experiencing respiratory problems that he self-diagnosed as *Pfiesteriosis*, and a handful of marine construction workers began developing skin sores on their legs from standing in waters known to host *Pfiesteria*.

While these cases were alarming, they remained anecdotal and had neither clinical nor epidemiological support. In addition, they were isolated. State officials interviewed wildlife specialists to determine if large numbers of small wild mammals had been dying or behaving strangely, and veterinarians to determine if they were seeing more ill dogs, cats, or farm animals. Neither group indicated an increase in such observations (Smith and Music 1998). Outside of the laboratory cases, which could be traced directly to *Pfiesteria*, there were so few cases of alleged *Pfiesteriosis* in natural settings that the same individuals were interviewed again and again for a variety of media and scientific reports. Although anecdotal and isolated, these accounts did make good reading. As Angell writes of health news:

Danger is a story; safety is not. With the extraordinary growth in media outlets, reporters must compete ever more desperately for stories. All important news tends to be rapidly exhausted by blanket coverage on all sides. Reporters who still have time and space to fill are then reduced to spinning out and inflating increasingly trivial details and ever more baseless speculation.... Health news, like celebrity murders or political sex scandals, is a particularly rich lode to mine, because the interest is already there—it doesn't have to be drummed up (1995:154-55).

The extent to which the media privilege anecdotal evidence is important to anthropological research since anthropologists, as well as other social scientists, have long depended on key informants. Several well-known works by anthropologists chronicle the lives of single individuals (e.g., Mintz 1957; Behar 1992), and others depend heavily on anecdotes to illustrate points that are supported by larger data sets or bodies of theory (see Johnson 1992 for a discussion of the relations among theory and informant selection). As useful as anecdotal information is to richer parts of ethnographic reporting, the *Pfiesteria* case shows that anecdotal information, presented without additional checks required in scientific reporting, can lead to flawed conclusions.

Pfiesteria as a Symbol of a Folk Model of Pollution

A third reason people have been drawn to the idea of *Pfiesteria* as a primal sign of environmental disaster derives from the organism's ability to join together two of the principal ways people think about dangers to the natural environment. *Pfiesteria* has not only been endowed with anthropocentric qualities; scientists working with the organism have claimed that certain human behaviors trigger the organism into transforming from a benign to a deadly state. Specifically, nutrient loading—the practice of allowing fertilizers, livestock wastes, and other nutrients to overload groundwater supplies—has been implicated as the primary cause of *Pfiesteria*'s transformation from a dormant, plant-like state to an active killer of fish and other organisms. This places *Pfiesteria* squarely between the natural and social worlds, conforming to a common method by which many in the Mid-Atlantic region and elsewhere conceive of events, things, and interrelated processes that are damaging to the environment.

In a recent study, researchers probed into the environmental knowledge of people in North Carolina and Maryland, determining that a common method by which people conceive of pollution is as a process in which nature and society join forces to damage the environment (Johnson and Griffith 1996). The comments of Hank Calhoun, a coastal resident in North Carolina interviewed for the Johnson and Griffith study (1996), are typical:

Interviewer: "How about this? Coastal erosion and acid rain?"

Hank: "Okay. Those would be pollutants from nature. Say, how can I put it? They would be pollutants that would be caused by nature.... Coastal erosion comes from the washing away of the shore. Acid rain, I know, is from the smoke that goes into air pollution—smoke stacks and stuff—and that causes the acid rain to burn off the tree tops and also to cause fish in the lakes to lose oxygen."

Similarly, in a more comprehensive, national study, Kempton, Boster, and Hartley (1995) note that people in the United States tend to interpret environmental incidents based on an obsolete equilibrium model from 1960s and 1970s ecology. Most individuals rely heavily on the concept of chain reactions, of linkages between human and natural phenomena in the creation of pollution (Kempton, Boster, and Hartley 1995:51). At the same time, these researchers note that, "people do not just passively receive new information, but rather actively fit it to their existing cultural models and concepts.... One of the practical consequences of these models is that they misdirect concern" (1995:85).

Pfiesteria fits within a chain-reaction-based view of natural processes quite well, being perceived as a consequence of an imbalance (nutrient-loading) in the environment which has been introduced by humans. While evidence of this remains a matter of debate in the biological literature (Paerl and Pinckney 1998), I point out here that this *reported* characteristic of *Pfiesteria* fits within preconceived notions of

how environmental damage occurs, lending credibility to the reports in the absence of contradictory information.

***Pfiesteria* as an Ethnic and Class Issue**

This is, perhaps, the most disturbing of reasons that *Pfiesteria* has received a disproportionate amount of attention relative to other environmental health risks, and the one that, ironically, sounds most like the conspiracy theories that underlay much of the initial interest in the organism. Several points, however, support the position that environmentalists have embraced the *Pfiesteria*-as-health-risk hypothesis because of their class and ethnic backgrounds and the material conditions those backgrounds entail. Two simple observations underlie *Pfiesteria*'s interest among predominantly white, middle-class or upper-middle class residents of North Carolina and Maryland. First, coastal property is beyond the reach of most poor people, unless they have inherited their property or bought it years prior to its increasing in value. Second, much environmental activism surrounding coastal issues is driven by primarily white, wealthy, and politically astute individuals (Li Puma and Meltzoff 1997). While Kempton, Boster, and Hartley report that environmental concern spans across several segments of society, including the poor and minority ethnic groups, they also acknowledge that environmental activism is dominated by wealthy white folk, a phenomenon "typical of activists in many political causes" (1995:7).

Environmentalists' interest in *Pfiesteria* attracted immediate attention from the political establishment. Organized wealthy whites tend to vote and contribute to political campaigns, making it almost inevitable for politicians to board the health-threat hypothesis. In addition to energizing voters, this was a relatively safe issue on which to show one's support of environmental causes. While the nutrient-loading issue is one that may eventually involve taking on organized agricultural interests, politicians did not need to restrict agriculture to appear environmentally conscious.

More importantly, the *Pfiesteria*-as-health-threat hypothesis enabled politicians to divert attention from more devastating environmental risks, such as rabies, lead poisoning, PCB contamination of food, and occupational injury (Music, n.d.). The health risks from occupational injury are particularly acute along both North Carolina's coastal plain and Maryland's eastern shore, the two areas where political uproar over *Pfiesteria* has been loudest. These regions are home to some of the most hazardous industries in the United States: food processing (Griffith 1993). These industries, however, hire low-wage workers and, increasingly, immigrants who either are not citizens or not interested in U.S. politics, directing their political energies elsewhere.

Conclusion

The *Pfiesteria* case underscores a few important lessons that anthropologists have followed for years while conducting research, yet also offers a warning against recent trends

in the discipline that are, in some circles, considered innovative methods of research and writing. The problems deriving from survey data reaffirm anthropology's skepticism of survey research conducted without the benefit of in-depth field research utilizing ethnographic methods. At the same time, the *Pfiesteria* case warns against relying too heavily on anecdotal information collected from one or two key informants without information regarding the distribution of the specific types of knowledge or behaviors in question.

This case offers further caution about sources of bias from key informants. Previous cultural models for making sense of observations or information can hinder the extent to which we can rely on native interpretations, despite their usefulness in identifying or clarifying untapped folk knowledge or in overcoming barriers to dealing with social problems such as perceptions of environmental risk. Similarly, we continue to be reminded, over a hundred years after Marx, that political and economic vested interests are sources of informant bias that can easily lead to misrepresentations of reality.

Finally, this case argues against the exclusive use of recent recommendations regarding ethnographic reporting and representations of others in anthropology. Increasingly, anthropologists are being trained to use metaphor, trope, and leaps of intuition to report their findings (Clifford 1989; Geertz 1992). While these methods of reporting may possess certain powers to convince readers of atrocities about which anthropologists were silent for too long, the *Pfiesteria* case suggests that an over-reliance on such reporting may, eventually, undermine anthropology's credibility.

Notes

¹Initially, dinoflagellates found with the fish kill were identified as *Pfiesteria*, but were reclassified by a scientist in Florida who had more precision equipment. This development led the scientist who had built her reputation on *Pfiesteria*, Dr. Jo Ann Burkholder, to begin calling these organisms *Pfiesteria-like* dinoflagellates, lumping them into a group of dinoflagellates that scientists have known about for years (*Gyrodinium breve*).

²Research into the health risks of working on the waters of Eastern North Carolina were funded by the University of North Carolina Sea Grant College Program and the North Carolina Division of Environment, Health, and Natural Resources, Raleigh, N.C. I thank these organizations for making this work possible.

³In natural settings, *Pfiesteria* is usually found in concentrations of under 10,000 cells per milliliter (N.C. Department of Natural Resources, 1991-1996). In the laboratory, scientists were working with concentrations of up to 90,000 c/ml (Burkholder et al. 1994). These levels have never been documented in the wild.

⁴I was interviewed twice by Roderick Barker for "And the Waters Turned to Blood." He mentioned the Preston book, *The Hot Zone*, as one of his models, and that he and Robert Rhodes, author of *Deadly Feasts*, had the same literary agent.

⁵Among the popular media sources that picked up this designation was Jack Van Impy for use in his Crusades broadcast. Van Impy routinely interprets the daily news with Biblical passages: in the case of *Pfiesteria*, he read from the book of Revelations, the scene where the

seven angels begin pouring the seven bowls of the wrath of God. The second angel's bowl poisoned the ocean; it was this passage that led to the title of Rod Barker's book.

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