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PUBLIC HEARING

before

SENATE SPECIAL COMMITTEE
TO STUDY COASTAL AND OCEAN POLLUTION

The account of fish kills in Sandy Hook and Raritan Bay,
the circumstances contributing to these fish kills,
and information regarding their underlying causes.

October 13, 1988
Middletown Township Hall
Middletown Township, New Jersey

MEMBERS OF COMMITTEE PRESENT:

Senator Frank Pallone, Jr., Chairman
Senator Richard Van Wagner
Senator S. Thomas Gagliano

ALSO PRESENT:

Leonard J. Colner
Office of Legislative Services
Aide, Senate Special Committee
to Study Coastal and Ocean Pollution

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New Jersey State Legislature

SENATE SPECIAL COMMITTEE
TO STUDY COASTAL AND OCEAN POLLUTION

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October 4, 1988

NOTICE OF A PUBLIC HEARING

The Senate Special Committee to Study Coastal and Ocean Pollution will hold a public hearing at 11:00 A.M. on Thursday, October 13, 1988 in the Main Meeting Room of the Middletown Township Hall at 1 Kings Highway in Middletown, Monmouth County, New Jersey.

The purpose of this hearing is to receive testimony concerning the fish kills that occurred this past summer in Sandy Hook Bay and Raritan Bay. The Committee is particularly interested in a complete account of these fish kills, the circumstances contributing to these fish kills and information regarding their underlying causes.

Anyone wishing to testify should contact Leonard J. Colner, Committee Aide, at (609) 292-7676.

Directions: Garden State Parkway exit 114. From the north, take left onto Red Hill Road (follow signs to Middletown) and continue until the road ends. From the south, take right onto Red Hill Road (follow signs to Middletown) and continue until the road ends. Make a right onto Kings Highway. Town Hall will be on the left at the intersection with Rt. 35.

From Trenton: New Jersey Turnpike exit 7A. Head east on Interstate 195. North onto Garden State Parkway.



SENATOR FRANK PALLONE, JR. (Chairman): We're going to start the hearing. I want to indicate that we do have certain people who have asked to speak and who represent State or local agencies, but this is a public hearing and anyone else who wants to speak is certainly entitled to. That's why we're here. If you would like to address the Committee at the public hearing, we have a sign-up sheet right up here. I would ask anybody who would like to speak to come up and sign in, and then we'll call on you in the order in which you signed in.

Okay. Let me start off by saying that this is a hearing of the Senate Special Committee on Coastal Pollution and that the reason for this particular hearing is to look into the problem of fish kills that took place this summer primarily in the Bay Shore area, which is, of course, the reason why we're having the meeting here in Middletown's Town Hall.

Let me just give you a little background about what the Committee is all about. About three years ago when the coastal pollution problem started to deteriorate significantly, several members of the Legislature decided that it was about time that we have a special committee to completely investigate ocean pollution and coastal pollution problems, and pursuant to resolutions I sponsored, the Committee was established and all of the legislators on the Committee are from the coast.

We have to my left, Senator Richard Van Wagner who is, of course, your own State Senator here in Middletown. In addition to that, Senator Gagliano, who represents the western Monmouth area we do expect to be arriving somewhat later. We also have two other Senators: Senator Weiss, who is from Woodbridge and also Senator Hurley, who represents Cape May. We're expecting that Senator Gagliano will be here; the other two will not.

The Senate Special Committee was set up basically to investigate ocean pollution problems and also to make recommendations with respect to legislation and enforcement

actions. And we have in the past done a couple of things in terms of investigation which have really borne fruit. One is, of course, that we arranged to have the Attorney General intervene in the suit that Woodbridge Township brought against the City of New York, because of the problem with Fresh Kills, and I'm sure that many of you are aware that as a result of that, a consent order was entered into, and the Attorney General is still pursuing actions against New York City because of the floatables and plastics and other debris coming from Fresh Kills.

We also had another hearing where we looked into the problem with raw sewage coming from Staten Island. As a result of our investigation and our request, the New York Department of Environmental Conservation reimposed a moratorium on new construction there. In addition, last year we put together a comprehensive report and a series of recommendations which became the basis for the bipartisan ocean pollution package. Most of those bills have been signed into law and were supported by the Governor and was supported by the leadership in both houses. They included the 1991 sewage sludge deadline. They included the medical waste tracking bill, the effort to fix combined sewer overflow problems in the State-- So we do have a very good track record in terms of both the legislation that we have proposed, which has been signed into law, as well as the investigations that we have conducted that have resulted in other government actions by either State or Federal agencies.

Our concern today though, is specifically focused on the fish kill, and particularly the one that occurred here in Middletown in the Bay Shore area in June of this year, of which there were at least two incidents. There have been fish kills in the past, but these two were particularly frightening because of the amount of fish that washed up on the beach; and because commercial fishing is important, particularly to the

Bay Shore area and particularly to the Belford area. And we are concerned about the future of the commercial fishing industry and how pollution is having an effect on the commercial fishing as well as the recreational fishing industry. This is the focus of the hearing today.

Now, I should point out that Senator Van Wagner, who is to my left, who is the Vice Chairman of this Committee and has been very active with the Committee, had requested that we have this hearing because of his particular concern, in that it affected his area. So, Rich, I'm going to turn it over to you now for your comments.

SENATOR VAN WAGNER: Thank you, Mr. Chairman. I think you've covered basically the reasons for this hearing and what the purpose and intent and objectives of this Committee is. We had hoped to conduct this hearing during the summer, but unfortunately, many of the individuals that we wanted to hear from regarding their findings were not available at that time.

Rather than go into or repeat the comments that you made, it's sufficient, I think, for me to say that based on what's happened over the past two summers and specifically what's happened this year, I think it's important that as much focus be brought to bear and as much information be developed as to what, in fact, we can do as a State to offset or to prevent from happening the kinds of things that are happening. Hopefully today some of the testimony that we will hear will shed some light on these problems.

I also have to indicate to you that I must depart this hearing in order to go to Trenton because the Assembly Appropriations Committee is hearing a bill that I sponsored which also has importance to this area concerning the Keansburg, Middletown, Hazlet floodgate or flood control project. I hope to return from Trenton after hopefully having that bill released. So, with your indulgence, Mr. Chairman, I will leave and then return. So, I think in the best interest

of our work now, we should begin to call the first witness.

SENATOR PALLONE: Thank you very much, Senator Van Wagner. We want to start with the Department, because we want to get some indication on what type of investigations and what kind of results have already occurred from those investigations. So, I'm going to start with the State and Federal agencies. From the New Jersey Department of Environmental Protection representing the Division of Marine Fisheries and Water Resources, we have Mr. Bruce Halgren.

B R U C E A. H A L G R E N: Thank you, Senator. I do not have a prepared statement. I have gone through some of our notes and just generally, some of the things that occurred the day before the kill, June 22. The USEPA was doing a routine helicopter flight. At that time, the DEP helicopter from Water Resources was not in action, it was down for repairs. And there were a lot, at that point, of red tides observed. As a matter of fact, the pilot who has been active running EPA missions since 1977, said that red tide organisms within the area that the fish kill was going to occur, was the most dense he has seen in the past 11 years. They did take samples and some 60,000 cells per milliliter were recorded of these red tide dinoflagellated organisms.

SENATOR PALLONE: Bruce, that was the day before that those samples were taken?

MR. HALGREN: Yes, sir.

UNIDENTIFIED SPEAKER FROM AUDIENCE: Could you speak louder?

SENATOR PALLONE: I think that those microphone are not for magnification. Is there one for amplification? (positive response)

MR. HALGREN: Which one? This one? (positive response)

SENATOR PALLONE: Okay. That's for amplification. The others are just for the recording.

SENATOR VAN WAGNER: Just repeat the portion of the testimony that relates to the test samples that were taken the day before and the observations made.

MR. HALGREN: The USEPA helicopter pilot observed some fairly dense algae blooms within the area that the kill was to occur on the following day. These were identified as dinoflagellated organisms, the typical organism for the so-called red tide episodes. They were at levels of the most dense that this individual had seen since 1977 and were recorded at approximately 60,000 per milliliter, which is quite dense.

The following afternoon after the reported fish kills, they also went out. It was fairly late in the afternoon. And they recorded oxygen levels ranging between seven and nine milligrams per liter. And again that's evidence of a very strong algae bloom that's actually within a given water temperature at time-- (Senator Gagliano arrives at this time) Senator Gagliano.

SENATOR GAGLIANO: Good morning.

SENATOR PALLONE: Senator Gagliano has arrived. Thanks for coming, Senator.

SENATOR GAGLIANO: I'm sorry I'm late. We just had the ground breaking for Route 18 -- the last of the missing link. We just got through that.

SENATOR PALLONE: Just so you know, we're starting with Bruce Halgren, whom you know.

SENATOR GAGLIANO: Right.

SENATOR PALLONE: Okay. Go ahead, Bruce. Continue.

MR. HALGREN: At any rate, on that afternoon, those high levels of oxygen are, again, typical of algae bloom conditions where the organisms during the daylight hours are producing oxygen and the water actually becomes supersaturated with oxygen. They followed this up with an early morning flight this morning, where they recorded both surface and

bottom oxygen levels that were lowest and close to shore at about 1.5, which is quite low, ranging out to four out toward the channel. So, it got progressively better oxygen levels on the bottom and the surface got progressively better as it went offshore.

Again, fish has a tendency to exhibit stress when oxygen levels are below two, and can produce mortality when they drop below one. As far as a biological sampling, I was notified of the fish kill some time during the day of the fish kill, I believe it was late morning, by both a private citizen and later also, somebody in the Township of Middletown. At that point, I contacted both Water Resources, our own pollution unit, which is part of our conservation officers, our enforcement group; and Sandy Hook to see if being much closer, they would be able to go out and investigate this fish kill, rather than trying to get somebody from my staff that's located down by Atlantic City up there to investigate.

Dr. Wilk is here. Fortunately, Dr. Wilk and his people were able to go out and look at that. And you'll get a more complete report on the biological sampling that was done by the people from Sandy Hook. That's about all the actual information regarding that particular fish kill that I really have. I'd be happy to answer any questions that you might have relative to either other activities or possibilities of what happened.

SENATOR PALLONE: Okay. Do you want to start? Go ahead, Senator.

SENATOR VAN WAGNER: I suppose that I probably should wait for Dr. Wilk to ask him some of the questions which refer to some of his comments made on June 28, 1988. I just want to clarify some of the things. In the article that appeared in the Asbury Park Press on June 28, 1988, the water samples that were taken, I assume over that weekend, continued to show dissolved oxygen levels at the bottom of the bay to be normal.

That was said by Herman Phillips, spokesperson for the Federal Environmental Protection Agency.

The DEP said that the oxygen levels were misleading since the samples are taken during the day when the oxygen levels tend to be higher. There was also a statement made that the DEP had said it believe that oxygen depletion caused by an algae bloom in the Raritan Bay early last week killed the fish. Is there a reason for the inconsistency in what the Federal EPA representative seemed to state? Although he did not rule out the algae bloom, he seemed to place that on a lower priority than either Mr. Staples or Dr. Wilk. I wonder if you have a comment on that?

MR. HALGREN: Well, first of all, I don't think it's really misleading. Certainly it's correct that oxygen levels during an episode of algae bloom are going to be considerably different during the day and the evening. During the day, because of photosynthesis, the algae produces oxygen. At night, through a continual living process, they consume oxygen. Therefore, the oxygen levels in the water will be considerably higher in the daytime than they will be late at night or before morning.

SENATOR VAN WAGNER: I understand that. What I'm trying to get at is, was there then and is there now an inconsistency between the approach taken by the Federal EPA, the DEP, and any other scientific people who were on the scene to investigate the matter?

MR. HALGREN: As far as stating a definite cause of the fish kill, I think that there is probably an inconsistency in that at least at one point. DEP made the statement to the press that the kills was probably caused by low dissolved oxygen. Certainly there was recorded low levels of dissolved oxygen. But no further scientific study on the fish that I'm aware of proved conclusively or showed that the kill was created by dissolved oxygen. Normally, many of the species of

finfish and other fish that were killed would have the ability to move out of an area of low dissolved oxygen. Also some were trapped, trapped in embankments, trapped in a cove, possibly in a channel in which case mortality would be more likely to occur.

By the number of fish killed, by the relatively small shore line in which they were blown in, it would indicate a relatively localized episode. In other words, it wasn't widely spread over the entire bay, or over a major portion of the bay or even over a major portion of Sandy Hook Bay--

The kill was not (inaudible) in that it did not seem to last for a long time. It seemed to be a very short kill, probably during the evening or sometime between the 22nd and the 23rd. The fish did not seem to continue to die and be washed up for more than that one period of time.

SENATOR VAN WAGNER: There were three incidents, though. Am I correct? One in the Raritan Bay--

MR. HALGREN: I know of at least two.

SENATOR VAN WAGNER: Two in the Raritan Bay. I'm sorry, one in the Raritan Bay and then a week later, one occurring in the Sandy Hook Bay. And I understand that later in August, there was an incident where fish washed up on Middletown Beach.

MR. HALGREN: The August incident?

SENATOR VAN WAGNER: I assume it was Ideal Beach.

MR. HALGREN: Yeah. The Ideal Beach incident-- We also had people there to look at it and I believe so did Sandy Hook. I don't think any guess was made as to what caused that. There were very few fish there. Representatives from our law enforcement unit were there. They took a tally of the fish and it was very low and we didn't pursue that any further. Very small numbers of fish being dead somewhere can occur from such a wide variety of reasons that it may be man-induced, it may be natural, you know. We did not pursue that particular one.

SENATOR PALLONE: Okay. Senator Gagliano, you can make some sort of opening comments now too, if you'd like.

SENATOR GAGLIANO: No. I don't have an opening comment. I just want to ask you, Bruce, whether or not, with respect to any of the two more major incidents -- one in Raritan Bay and one in Sandy Hook Bay -- and the one at Ideal Beach, whether or not there was any chance that this could have been, shall we say, man-induced? And let me just explain.

I was with a group not too long ago, and one of the members of the group, a fisherman who makes his life fishing, indicated that there are illegal netters operating at night in the bays -- Raritan Bay and Sandy Hook Bay -- that in this particular instance the illegal netter was about to be apprehended and cut his net loose and then the next day or so, went back to get the net back and, of course, at that point whatever fish were caught in the net were dead. I have no proof of that; I just have a statement by a person whose name I don't even know and I wouldn't repeat it if I knew it, because I understand that it's sort of like war out there sometimes.

But is there any chance in your opinion that this could have happened as a result, any of these could have happened as a result of that sort of thing?

MR. HALGREN: Well, the large one where we have pretty good biological information of the species encountered, I'd say, definitely not. Too many animals--

SENATOR GAGLIANO: A big cross section of small and large fish?

MR. HALGREN: Very small fish that wouldn't be trapped -- you know, shrimp and things like that -- that would not have been trapped in a nautical net or involved in that kill. At Ideal Beach, at least that our enforcement people saw, which were smallish finfish, could have been definitely from a cold catch, it could have been from almost anything. Again, that's very difficult to determine whether it could have been from a

dragger, even somebody tending their eel pots that they had gotten a number of small fish in their eel pots and released them dead.

SENATOR VAN WAGNER: Could I just--

SENATOR PALLONE: Sure. Go ahead.

SENATOR VAN WAGNER: A comment made by Dr. Wilk, who I know is here and hopefully we'll be able to hear from him -- I'm quoting him. "This was a real quick demise to the fauna of a total area," Wilk said, "All the fish that occur on the bottom during the summer months were there. Something stressed the marine environment. It takes an awful lot to cause what we saw on the beach."

MR. HALGREN: I concur completely. I think that's what I just said.

SENATOR VAN WAGNER: Having concurred with that now, has there been any conclusion reached as to the point source or non-point source or the source of what created the quick demise to the fauna and the stress to the marine environment?

MR. HALGREN: The answer is simply, no -- at least to not my knowledge. Had a separate fund been available dedicated to chemical analysis of some of the fish being very fresh, it's possible that a wide scan detection--

SENATOR VAN WAGNER: A separate fund?

MR. HALGREN: Some available funding source to do chemical analysis of some of this fish may--

SENATOR GAGLIANO: What would that cost?

SENATOR VAN WAGNER: Are you saying to me that the Department of Environmental Protection cannot or does not, in a situation that occurs of this magnitude, find a source of money to do a chemical analysis of something that could be of major significance to the people of the area; that they would have to come and get a special appropriation to do that?

MR. HALGREN: I don't think I mentioned anything about a special appropriation. I don't think that's--

SENATOR VAN WAGNER: Or a fund? I'll use the word, "fund."

MR. HALGREN: I'll just say that at that time--

SENATOR GAGLIANO: We're sensitive to appropriations.

MR. HALGREN: Yes. At that time. Certainly, we didn't have anything available to run a full gamut investigation on, you know, a number of fish to try to determine if a chemical cause was the cause of this kill when based upon pretty strong information from the Division of Water Resources. There was a very strong algae bloom in the area and low DOs at night. And that, at least, is a possible explanation for the cause.

SENATOR VAN WAGNER: Why wouldn't someone have stated that at that point, that what we need here and now is a specific fund or a specific direction in order to perform such a chemical analysis, would seem to me to be rather logical considering the fact that the Department lapsed \$38 million at the end of this year of unspent monies?

MR. HALGREN: I can't answer you. I can say that it was discussed in the Department's toxic and biota committee and that it was agreed that such monies should be available on an as-needed basis. Most of the monies, as I'm sure you are aware, within the Department are allocated for very specific purposes. And again, for a specific purpose of having monies available in the case of an incident where no obvious cause of such a kill is apparent and then that money would be needed; you know, it would be an unusual type of program to have money set aside, in case of an occurrence of this type. Normally it's for strict monitoring and there's a lot of water quality and fisheries' monitoring for toxic contamination and other things. But there's no, again -- to the best of my knowledge -- money just available in case of-- Okay? It's not an overall budgetary problem, but there just wasn't any such thing set up.

SENATOR VAN WAGNER: I have to say this to you, Bruce, and I realize that you're not responsible, certainly and totally -- I realize that -- but the Department of Environmental Protection, I would assume, has a budget somewhere in excess of \$300 million?

SENATOR PALLONE: They're the largest department. They have more money than any other department.

SENATOR VAN WAGNER: They are the largest then? The Department of Education is not higher?

SENATOR PALLONE: Yes. They have more.

SENATOR VAN WAGNER: Okay. Probably, no more focus on any single issue in this State than on the issue of pollution, ocean dumping, and related incidents there too-- Is it your testimony here that under these conditions that there is no vehicle, no possibility of interfund or intrafund transfer to handle a situation that occurs -- that apparently would be better detected if a chemical analysis were performed?

MR. HALGREN: No. I'm not saying that. What I'm saying is that this type of fish kill that occurred in Sandy Hook is quite an unusual fish kill. Menhaden fish kills are quite common. We're fairly certain that in almost all cases we know the answer and the reasons why they occur. The very large-scale anoxic fish kill that occurred in 1976 off the coast entailed very few finfish. Those that were killed -- reported mortalities by scuba divers and such -- were located around wrecks and other structures where they just stayed a little too long. Finfish have a great ability to move, so most of the mortalities, associated with that fish kill were benthic organisms -- things that couldn't move, like the surf clams and other things.

So, it's not even something that I think at least was something that we had forethought of setting up any particular fund or fund vehicle to react very quickly to this; and you do have to react quite quickly. You almost have to know ahead of

time that a fish kill is significant. It's going to look significant. The samples have to be taken very quickly, frozen, prepared correctly and according to procedures of specially washed -- special types of aluminum foils. You can't just put them in plastic. You can't put them in anything else that they are going to be contaminated from. Again, it's the type of thing that that you almost have to anticipate, to be ready to do something like this, and it's just a very unusual occurrence.

Again, we did talk between the agencies including Sandy Hook, the EPA--

SENATOR VAN WAGNER: Dr. Wilk said scientists were finishing up some chemical tests and should be able to list probable theories by the end of the week.

MR. HALGREN: You'll have to ask him what those tests are.

SENATOR VAN WAGNER: Okay. Thank you.

SENATOR GAGLIANO: Mr. Chairman, one last question.

SENATOR PALLONE: Go ahead.

SENATOR GAGLIANO: In the immediate area, water analysis was taken as quickly as possible and there was no solid proof from the water analysis of what would have caused the kill, except for the possibility of low levels of dissolved oxygen. Is that what I understand?

MR. HALGREN: Yes.

SENATOR PALLONE: The reason that what you're saying now concerns me a great deal is because of, I don't know if it was in the newspapers, there were rumors, or there were commercial fishermen, who indicated to me that there was some possibility that this was related in some way to chemicals or toxins that was in the water or in the underground -- in the silt underneath the water.

What I wanted to know was that I have heard -- again and this is just a rumor and I don't know where I remember it

from -- that there was dredging taking place in the Raritan Bay at the time and that there was a possibility that some of the silt, which can be on occasion toxic from years of industrial pollutants or whatever, somewhere in the bay had been turned over, and that therefore there was some sort of relationship between the fish kill and some toxins underneath the water as a result of some sort of dredging operation. I just wondered if there is any indication of that?

MR. HALGREN: None that I'm aware of. 'Certainly anytime that you're dredging, especially maintenance dredging, channels dredging within an area like the Raritan Bay, Newark Bay, where you have long-term fine organic sediment which can tie up a lot of the toxics in the water that may be in the water in that area, you have the potential and undoubtedly do re-suspend some of those chemicals within the water column. This is done in that dredging activity that occurs in much more highly -- I would assume -- much more highly toxic areas, such as Newark Bay and up in the lower Hudson River. Again, I'm not associated with a significant fish kill of this type. I would think that would be a highly unlikely circumstance.

SENATOR PALLONE: But the problem is that if we don't have this chemical analysis that you say did not take place, then we really have no way of knowing whether or not the fish were killed as a result of some sort of toxic reaction or chemical reaction as opposed to depleted oxygen levels. Is that what analysis would have shown?

MR. HALGREN: May have shown.

SENATOR PALLONE: Well, my impression when you first started to tell us about this so-called fund was that the reason this analysis wasn't done was because the money wasn't available. But later, Bruce, you gave me the impression that it wasn't so much that the money wasn't available, but because of the initial analysis which seemed to indicate that there was an oxygen depletion problem, that it didn't seem necessary to

go to that next step and do the chemical analysis. Was it because there wasn't money available or was it because it wasn't felt necessary to do the chemical analysis?

MR. HALGREN: Probably quite a number of things: One, as an afterthought -- and we talked about and did discuss it -- certainly money wasn't immediately available. Obviously, there was money in the Department. With time, the money could have been put together.

SENATOR PALLONE: I mean, there's not--

MR. HALGREN: In the meantime, again, you know, unfortunately a lot of fish were sampled and stored right away for the possibility for later analysis. Again, it's sort of something that you have to think of on the spot while you're there. It's not something that you can follow up on two or three days later, and do.

SENATOR PALLONE: See, Bruce, the only reason that I'm mentioning this is that -- and I'm not trying to say anything with regard on your part -- but I know how the appropriations process works. I know that the DEP does have discretionary funds available, so that if someone had made a decision that we should do this analysis and that this is important enough to do, that the money would have been available.

And we've had that just in our own area, for example with clamming, you know, where funds were not available to hire certain officers or whatever and the Commissioner of DEP made arrangements with the Treasury Department or with the Governor's office, or whatever, to get some extra funds. So, I mean, I really-- To me, this notion that there isn't the money doesn't really make sense. If someone decided that this is important enough to do, the money could have been made available.

It just seems to me that something's wrong. I mean, clearly, a decision has to be made with something like this to impound the fish or whatever you do -- do the analysis and find the money. And it wasn't.

MR. HALGREN: That's right. That decision has to be made immediately, however.

SENATOR PALLONE: And it wasn't.

MR. HALGREN: It wasn't.

SENATOR VAN WAGNER: There's no one with line responsibility in an incidence such as this to make a decision on the spot to immediately take the action that has to be taken to determine the cause of such an incident?

MR. HALGREN: It would even be easier than that. Assuming you were collecting fresh fish in a fish kill, and in this case they were, you could take a lot of those fish, you know, a fairly good sized sample of several different species, handle them properly, of course, you'd have to be somewhat prepared for them and freeze them, and the determination could be made at a later date as to whether or not chemical analysis was necessary.

SENATOR GAGLIANO: Could we have boats up and down the-- They could have been thrown in a locker room freezer in any of the boats for a few hours and frozen and then checked? It's kind of shocking.

I guess the next question is, supposing we left here today and you received a phone call and they said that there's a fish kill in Raritan Bay. Would you be prepared to do all the tests that would be necessary in order to try to determine what caused the fish kill? Or tomorrow? Or next spring? Or next summer? I guess one of the things that we do at these hearings is try to dope out what the problem is. And maybe we missed out on that one.

But suppose we get a call in one of our offices next year and they say that there's a big fish kill in Raritan Bay, what would DEP do at that point in order to determine what caused it?

UNIDENTIFIED SPEAKER FROM AUDIENCE: Good question.

MR. HALGREN: I certainly think that the appropriate

collections could be made and if they are done, appropriately and timely, then that decision could be made at a later date. And I can't speak for the Department, in that case, but I'm quite--

SENATOR GAGLIANO: Would you suggest to the Department that they be ready for that?

MR. HALGREN: I'm quite sure that that would occur. Yes.

SENATOR PALLONE: Well Bruce, the bottom line is what can be done legislatively in terms of appropriations to prevent a situation like this from happening again? We certainly want-- I mean, you're indicating to us that there's a problem in that this may have not been handled the way it should have been. What can we do to make sure that it's handled properly in the future or what has to be done?

SENATOR VAN WAGNER: What can you do? Just let me interrupt for a minute.

MR. HALGREN: Again, and it can be exactly that -- what can I do?

SENATOR VAN WAGNER: Yeah. Because you know, Bruce, and this is not aimed at you, but we sit here as legislators, conduct hearings, get phone calls, get letters, take action, introduce legislation, prepare resolutions, go before budget committees, spend hundreds of millions of dollars on departments that have management responsibilities, that have goals, objectives and missions to carry out on behalf of the taxpayers. I cannot believe that a department, such as the Department of Environmental Protection -- with the kind of focus and attention on the issue of water pollution, ocean dumping, the fouling of beaches, and 100,000 fish killed over a period of three days, as reported by Mr. Carmichael, estimated-- And there is no management line to take the proper steps at this point in time to do what has to be done to make determinations as to what actually caused it or what might have caused it. I can't believe that.

MR. HALGREN: I think frequently we do. First of all, we do react to any fish kill that we get, either through our pollution unit or through the Bureau of Marine Fisheries. Those collections are made. We do have a fish pathologist. The fish pathologist will look at fresh fish and try to make a determination as to the kill, when those fish were killed-- (inaudible). There are options open to us. We do normally take collections. Again, it's part of the policy that we generally follow.

SENATOR PALLONE: Well, Bruce, you know what, I want to go to the next person, because I know that Rich has to leave, but can you stay, because I have a number of questions I want to ask about, you know, what we do in the future with this. But if you can stay--

MR. HALGREN: Yes.

SENATOR PALLONE: All right. Thanks a lot. We want to get back to you. Let's call Stuart--

SENATOR VAN WAGNER: You're going to get no answers.

SENATOR PALLONE: Well, that may be, but we're going to see what we can do. Stuart Wilk, who is the Chief of Environmental Analysis Investigations for the National Marine Fisheries Service. And again, Mr. Wilk, we just mainly wanted to know what investigation was done and what was found as a result of the incident in June?

SENATOR VAN WAGNER: Did I quote you correctly, from the paper, Dr. Wilk? Or did the paper quote you?

S T U A R T J. W I L K: I'm not quite sure which paper that came from?

SENATOR VAN WAGNER: That was the Asbury Park Press, June 28, 1988.

MR. WILK: I'd have to see it really.

SENATOR VAN WAGNER: Yeah. Well, I'll furnish you with a copy.

MR. WILK: You know it's very difficult. I must have given out several dozen, or 20 or so interviews and what comes out in the press and what you say in some cases is not necessarily the same, as you probably are well aware.

SENATOR PALLONE: We're very much aware of that.

SENATOR GAGLIANO: Sometimes it even sounds better.

SENATOR VAN WAGNER: I can assure you, I only used what was put in quotes.

MR. WILK: I realize that, Senator. In terms of our involvement, we were contacted on the 23rd of June regarding the fish kill in the Leonardo area by Bruce's office -- Bruce Halgren's office. We then proceeded to the area and we made an investigation in the area which included observations relative to the abundance and the distribution of the animals; what kind and what type. We took water samples and we prepared this report which I think your office has already received. I have additional copies for anyone else who is so interested. This was done the day after the kill.

That same day we sent out -- this is regarding the Leonardo kill -- we sent out our vessels the following day and we took extensive chemical measurements along several transects along the bay. We also did some troll stations where we actually dragged for fish on the bottom the following day.

The results are pretty much summarized within this document which you have in your hands. It's an initiated list of the species of fish that we noted and the large invertebrates. The oxygen levels that we took at the site in Leonardo at the breakwater -- not the breakwater, there's a jetty that goes out; it was graded at five parts per million, which is not considered at this time of the year -- or at the water temperature that's measured, to be stressful. Our agency considers two parts per million or less to be stressful to sensitive species. And when we're talking about sensitive species, we're talking about primarily upper water column

filter feeders, such as menhaden that created a lot of energy and need a lot of oxygen and so forth. Other species such as memidia, the silveride.

That basically summarizes our involvement. The next day's observation, we found no dead fish in the trolls that were taken close to the area and throughout the bay. We noted no oxygen levels less than 3.5 parts per million. Again, for this time of year and in this area, a highly productive area that it is, those are not uncommon daytime averages.

As Bruce mentioned, the oxygen tends to sag at night as the animals use it, the (inaudible) use it, and it goes the other way during the daytime. Basically that was it for the Leonardo fish kill.

We responded to two other fish kills; one in the Ideal Beach area. I think one of my staff went there, but I think it was a day late, and there were few animals left on the beach. According to his report to me, approximately 50 small fish were found on the beach area, that was on August 3 that was observed. We responded to another fish kill -- or what you might call a fish kill -- in the Shrewsbury River right after the one that must have been in either early or late July and found no evidence of any dead fish. Just somebody called and said that there were large numbers of dead fish and some foul smelling water. We sent a group of people out and did not find any dead fish in that case.

Basically, that's been our involvement with the incident. And primarily, our involvement was with the incident at Leonardo, or the evidence was from Leonardo.

SENATOR PALLONE: Senator Van Wagner.

SENATOR VAN WAGNER: Did you take any chemical tests of the fish?

MR. WILK: We took specimens and it was deemed after the fact that they would not be usable for organic analysis, because of the freshness. This is an area that I think needs

to be clarified. In order to analyze for organic, "toxicants," you have to have fresh animals. If they are not, the normal decay processes, as well as, oxydation -- these things change. So, what you'd be measuring might not be at all what was in the animal, themselves. It must be fresh. It must be prepared, as Bruce said, with various rigorous procedures. It was deemed after the fact -- we had taken several flounders and some crabs -- that it was too late for that kind of analysis.

However at the site, we examined quite a number of fish for any evidence of pathology. The external pathology had found none. That's not included in here, but it was part of our normal examination.

We were probably as ill-prepared for this as anybody else. We're not normally in the business of going out and checking out fish kills. We have responded, at least in my career in the Federal service, to hundreds of them. And as I've stated, or has been reported in the press, this was, in my eyes, the most unique one I've been to. In most of the others perhaps the magnitude was far larger than those associated with menhaden kills, die-offs, or what have you; large numbers, a very huge amount of menhaden.

This was very unique, as it is stated in this document, in that we observed 18 species of fish and I don't know how many species are invertebrates? (peruses report) I guess of those that we picked out, four species have been called invertebrates. Those species represent what one might call the guild of fishes that is common to this area during the summer months. Most, if not all of them, migrate out of the area at one time or another during the late fall and they are replaced by other species.

If one was to look at some of our reports or printed information on specie diversity and definition of species assemblages, this would be a classic example. That's what I was trying to bring out in this document.

SENATOR VAN WAGNER: A classic example of that--

MR. WILK: Of that guild of fishes.

SENATOR PALLONE: What's that?

MR. WILK: The morsel fishes that you would normally find in an admitted Atlantic estuary during the summer months outside of the actual shoreline fishes -- those fishes that might be found in the eel grass and so forth.

SENATOR VAN WAGNER: So in other words, varieties of fish that were found, first were characteristic of estuarial habitat of an area -- number one. So, it was unique in the fact that so many different varieties were killed?

MR. WILK: The primary fish kills that we go to -- that we are called to examine to do what we can, which is usually after the fact, as we all realize -- are usually in this area. The large-scaled ones are associated with many of them. And that's for very good reasons -- the physiological rates -- they get trapped in confined shallow areas. As tides go out, they deplete the water of the oxygen themselves. They get more and more stressed, consume more and more oxygen and you have the classical fish kills that probably have gone on.

SENATOR GAGLIANO: Bruce, I was always under the impression that with menhaden that it was a natural process. I mean, I've seen menhaden wash up on the Shrewsbury River from the time I was a little kid down there.

MR. WILK: It's been some of those mortalities along the coast, and it happens in all areas -- that they do occur, have been associated with several things. Primarily, low oxygen and entrapment of the species, usually being herded by predators. The other one is gas bubble disease which is a disorienting disease that the animal incurs. Nobody knows what does it. It tends to disorient them and they tend to go through the same thing. The other one is the dumping of fish -- unwanted quantities of menhaden and they just end up on the beach.

SENATOR VAN WAGNER: Given the uniqueness of this incident, the fact that so many different varieties of animals were killed, was not your scientific curiosity piqued?

MR. WILK: Yes and no. Maybe that's the pessimist and the optimist. In many cases in having looked at fish populations throughout the western Atlantic, when you have an incident such as this or an occurrence such as this -- we won't call it an incident -- it's very difficult, if not impossible, to determine what caused it. You can go through the total bag of potential causes. It can be environmental stresses of all different kinds, it can be natural occurrences that later on lend themselves to such things as low amount of oxygen, high temperatures, low temperatures. You know, it goes on and on. Many of the statements that I made regarding this is that-- What we saw was the horse out of the barn and we cannot go back and reconstruct what happened in that barn or even what the barn looked like -- from the Federal point of view.

SENATOR VAN WAGNER: In your own words, you're saying to me that something that's stretched the marine environment to this extent -- and I quote, if the quote is correct, "The extent that it takes an awful lot to cause what we saw on the beach cannot be reconstructed.

MR. WILK: I don't believe so. No.

SENATOR VAN WAGNER: Not even a logical educated presumption can be made as to--

MR. WILK: First of all, in the scientific world, in the literature that's available regarding these types of incidents, you know, you can go back through it and you can probably come out with four or five potential causes -- all of which would not be unique to an area such as this area: Biotoxins, that's the common one that causes the red tide that's associated with the red tide in the Gulf of Mexico.

SENATOR VAN WAGNER: Biotoxins?

MR. WILK: Okay, let me clarify that. That's one reason, but not the only one. And it's not in any order.

SENATOR VAN WAGNER: I realize that. I know you're going to collectively--

MR. WILK: Okay. Certain dinoflagellates -- certain microorganisms that are in the water, when they die off, produce a toxin which becomes a secondary effect on the fish along with low oxygen levels which have already stressed the animal. In talking to our microbiologists, the animals here don't produce that biotoxin. Certain ones do, but for the information that we pieced together from the State as well as other sources, the organisms that were present in the low oxygen area that was up the bay from where this fish kill occurred, did not produce that biotoxin.

SENATOR VAN WAGNER: All right. Let me take out biotoxins. I got dinoflagellates.

MR. WILK: Okay, dinoflagellates.

SENATOR VAN WAGNER: Yeah. You said a secondary cause.

MR. WILK: No, the dying off of the dinoflagellates produces the biotoxins.

SENATOR VAN WAGNER: Okay, so we've got one and two eliminated. You said about five.

MR. WILK: That's one potential cause. The other one is obviously if you have no oxygen, things will die. I can tell you that we witnessed this low oxygen and depleted oxygen and have not witnessed fish kills similar to this. Okay, the '76 fish innocuous condition in the ocean did nothing but congregate the fish in the bay. We have evidence of that. There was no large die-off other than sessile organisms. Then you have all of the potential-- That's low dissolved oxygen or no oxygen. You have all man-induced potential things -- dumping of certain things in the water, dredging up certain things in the water-- You can go on and on and on, Senator. You know, you can just think of all of the horrible potential

things, and all of the rumors, and all of the potential things that you've heard other than dissolved oxygen in your travels -- and you can run the gamut -- the bottom line is that you cannot, at least in my opinion, pinpoint the cause or put the cause and effect together in this case.

SENATOR VAN WAGNER: So, in other words, what you're saying to me from a scientific point of view, at least, is that there is no way that we as legislators or a Department charged with the responsibility of both regulating and protecting the environment could in any manner, shape, or form derive from an incident such as this, some conclusions which might lead them toward solutions toward preventing it from happening again?

MR. WILK: Yeah. I think you can do it. I don't know if you have enough money. The bottom line is that you have to monitor continually throughout the waters that you are interested in for any number of things. Many of those analyses can be very costly. I can tell you that. You could do experiments to look at hypotheses such as what effects low dissolved oxygen have on particular species or groups of species. We're conducting those kinds of experiments now. Those are academic experiments. You can monitor a large ecosystem like the Raritan/Sandy Hook/Lower Bay system. Electronically, the gadgets cost \$3000 to \$10,000 apiece. You probably need a lot of them. I wouldn't guess without doing some calculations.

That would only give you some measurements. Then you have to put those together with an incident. I can tell you this now, that you have low dissolved oxygen levels in the bay every summer, because it's one of the most productive areas in the United States -- not only in the United States, but in the world -- when you have that kind of production, you have ups and downs. You have consumption, you have production, and you have crashes and falls that happen on a day-to-day, if not weekly, basis. So, you have to continually monitor it. And then you have to extrapolate backwards.

SENATOR VAN WAGNER: Yeah. I understand. This is not your responsibility. But I thought that's what we were doing, you know.

MR. WILK: I disagree with that. It's part of our responsibility.

SENATOR VAN WAGNER: But I mean, I thought that we as a State were continually monitoring.

MR. WILK: Monitoring is a very costly habit.

SENATOR PALLONE: The monitoring that's done now is strictly for bathing purposes.

MR. WILK: Yes. Chloroform bacteria and dissolved oxygen levels.

SENATOR PALLONE: It's not for this purpose, and it's also only in the summer; not beyond Labor Day.

MR. WILK: If you talk to the bait and tackle dealers, they'll tell you that all of the problems go away after Labor Day.

SENATOR PALLONE: Senator Gagliano.

SENATOR GAGLIANO: I talked to some boatmen the other day. You can see down 15 to 20 feet -- crystal clear.

MR. WILK: There's a reason for that. And that is that all of this production tends to shut off when the water temperature drops. The water temperature has dropped about seven degrees in the last week or two. So, what you have is all of these microorganisms that provide beginnings of the food chain, disappearing. Along with that clear water, you also find that most of the fish have left, too.

SENATOR GAGLIANO: Yeah, true. They said that also.

SENATOR PALLONE: Just an explanation. I have a lot more questions, but I don't know if we may get to some of the others and come back to you also. Your conclusion seems to be that this most likely came from the low oxygen levels.

MR. WILK: No, sir.

SENATOR PALLONE: No? Well, what do you put it to?

MR. WILK: Okay. To be as scientific as I can without saying I don't know, I would say that an incidence like this can be caused by almost any number of things which I mentioned already. And I don't think any one of those can be ruled out with the evidence we have in hand, which is basically, in my eyes, this document, which enumerates what we saw. The measurements we made after the fact -- at the site, the animals were already dead -- the oxygen levels were greater than five parts per million. The following day, we noticed--

SENATOR PALLONE: That was the day of the incident.

MR. WILK: Yeah, okay. There was no dead and dying fish when we got there. In other words, there was nothing flopping half dead. Everything was dead. So, the incident may have happened earlier than we got there, perhaps as much as a day or so earlier.

SENATOR PALLONE: All right, but then in other words, I mean it would seem from Mr. Halgren's testimony that he was saying, it was more likely the result from depletion of oxygen. But, you're not even willing to go that far, because you really have very little basis for making that conclusion.

MR. WILK: With the little bit of experience that we have and the little bit of scientific information that's available regarding low or zero oxygen levels, we know that animals can sense these. We know that they are for the most part, and the good majority of the ones that you see here, are mobile enough to escape that. These incidents, as the one in '76, which was far more extensive than this and far more catastrophic in terms of the duration-- We didn't find dead animals or the guilds of animals as you see here. It's not to say that we've ruled out dissolved oxygen or that I've ruled out dissolved oxygen. It would have to be a real unique situation to have caused that. And with the tidal, you know, amplitudes, currents, and what is going on in that bay, I just don't know. I don't rule it out, I don't think it's-- You know, I can't condone it.

SENATOR PALLONE: But with the uniqueness of the fact that basically all species of fish or most of the ones that were in the bay at the time died.

MR. WILK: Okay. Let me clarify that. These are demersal fish. Okay? Actually, when you look at things, you look at them, at least I do, on three levels. You look at things that are pelagic, semi-pelagic, and demersal. Demersal being on or near the bottom -- probably associated with the first one or two meters off the bottom. There were very few, if any, of the other species, assemblages, or groups involved here. In other words, mid-water species, they don't normally occur in the bay because it's relatively shallow. The other group of fishes that is absent here are the upper water and the schooling fishes such as menhaden.

SENATOR PALLONE: So, it's the bottom fish, then.

MR. WILK: These primarily are bottom or near the bottom dwelling fish.

SENATOR PALLONE: Well, I mentioned before and again, just based on a rumor which I don't have any information on that there might have been some disturbance of the bottom, is it possible that that was the cause? That there was some disturbance of the bottom, or there was some sort of toxic material?

MR. WILK: Again, you cannot rule it out. Having been involved in some large-scale toxic work with PCBs primarily with bluefish and with other species such as striped bass, the levels in the sediment, except in rare instance, are levels that would cause mortality in a short period of time -- at least those organics that we are familiar with, the organics such as PCBs, the PAHs, and the halogenated pesticides, chlordane, DDT, and so forth.

Those levels and the levels that are observed in fish in the ambience don't appear to be detrimental. We're looking at hundred parts per million of PCB, say in striped bass. It's

not affecting very much in terms of their physiology. It's affecting their marketability, but not their physiology. The same thing is true with bluefish. When we've examined those white perch and white catfish, it affects their marketability, but apparently not their physiology.

SENATOR GAGLIANO: Not their ability to live.

MR. WILK: Not their ability to live.

SENATOR GAGLIANO: Can I just try to sum this up?

MR. WILK: Sure.

SENATOR GAGLIANO: From what I've heard so far, the real fish kill was only at Leonardo that can be described as a fish kill of any magnitude. You said that you arrived at Ideal Lake about a day late. There was 50 small fish approximately found dead--

MR. WILK: Yeah.

SENATOR GAGLIANO: --and that's not tremendous, in my opinion. And then the one in the Shrewsbury River, which was in late June, you found no evidence of dead fish. Obviously, there might have been dead fish, but they were either eaten by predators, or just carried out with the tides. So, the real one was at Leonardo. And that was apparently thousands of animals.

MR. WILK: Yeah, The one at Ideal Beach-- I'm just reviewing this document that was, you know, by one of my staff-- According to one of the eyewitnesses there, the real kill actually occurred on the 1st of August and we were there the 3rd of August, and there were a few dead fish. There's some indication here that that may have been associated with entrapment of these species and the low oxygen potential. But again, we were there three days late. This one we're there a day late, probably; perhaps a month too late to backtrack.

SENATOR GAGLIANO: So, that the one at Leonardo, mainly bottom fish-- You heard my comment before. And of course I got that by way of a rumor from a fisherman. Did

anything about that indicate to you or to the officials who had examined it, that it could have been a man-made entrapment which caused the fish not to be able to--

MR. WILK: I don't think you can dismiss that as well as any of the other potential causes that I've already elaborated.

SENATOR GAGLIANO: But there's no proof of it, either.

MR. WILK: No proof of that, either, at least in my eyes.

SENATOR PALLONE: I know that there was one person from the Belford Seafood Co-op that wanted to speak and I wanted to see if we can get some input from him also. But could you also stay for a little bit?

MR. WILK: Certainly.

SENATOR PALLONE: All right. Let me just ask one more question. Then I want to get him up here, because then, I figure, we can go back to you.

What can we expect in the future because of the low oxygen count? In other words, are fish kills, you know-- Is the situation with the bay going to get better? What measures need to be taken in the long run so that we don't have the continual build-up, or are we going to see more of these fish kills? A very broad question.

MR. WILK: Now you've done the same thing that many other people have; you've associated the fish kills with low dissolved oxygen. Can we divorce that and talk about low dissolved oxygen? Low dissolved oxygen is a common occurrence within estuarine systems for as long as we've measured them. We don't have any idea whether this idea is getting better or getting worse, because we don't have long-term numbers or a long-term data base to evaluate that.

It's the same question that we're asked many times: Is the ocean better now than it was five years ago? And the answer is that we can only answer that in certain instances

where we've had certain things removed. Okay. The low dissolved oxygen is the ups and downs in peaks associated with production. Okay, production is much the same as growing your grass on your front lawn. If it's fertilized, it's nice and green. If you give it a little bit more fertilizer, it grows a little bit more. That's what's happening out here.

And that situation is from naturally induced nutrients. The nutrients are what are basically called non-point source pollution. That can be the run-off after a storm. Those of you who have homes and somebody makes the grass green, and if it happens to rain at the wrong time, it goes down the storm drain and ends up in the river. Those phosphates, nitrates, etc., can cause these blooms. These blooms can also happen by themselves. I don't know if I've answered your question.

SENATOR PALLONE: Yes, you have. I mean, the main cause, or I would say, other than natural causes, the main man-made causes from--

MR. WILK: We will have low oxygen dissolved caused by one thing or another as long as we want to measure it.

SENATOR PALLONE: But non-point source is in continual build-up from the nutrients, and phosphates can aggravate the situation.

Okay. As long as you're willing to stay, I want to move on so that we can get a little more input maybe from some of the people who work in the industry. I see that Mr. Les Layton, from the Belford Seafood Co-op wanted to testify, and then I'm going to get to Mr. Carmichael so we can get some input from local health officials.

L E S T E R L A Y T O N: Thank you. My name is Les Layton, I'm a member of Belford Seafood Co-op and the New Jersey Fishermen's Association. I'm here solely just to maybe add another theory to what you have, and observations that I have made, being a member of Belford Co-op in the immediate

vicinity. I've heard it could have been illegal pirate operations -- fishermen at night. It could have come from that.

From the testimony I've heard already, I would like to say that I don't really believe that it is illegal fishing operations, just by the magnitude of fish -- that the draggers predominantly, who work in the bay at times, do not catch that kind or volume of fish, and they don't work that close to shore just because they are constricted by the draft of their vessels. They can't get in that close. So, it just wouldn't fit the puzzle; if you could say we have a puzzle here.

The other conclusion that I have drawn myself, and I have worked on ammunition piers at times as a carpenter working on ammunition ships, is that there is a flume tank at the base of Earle Pier which is used for-- I believe it was built and worked by a private contractor. It's used for oil spills. It's the largest flume tank, approximately a quarter of a mile long, and it has wave action and stuff to it. They introduced chemical and oil spills into this thing and try to disperse the oil from making pollution on the beaches and stuff. This is just my theory. I don't have any proof whatsoever. But, to me it's a logical conclusion on my own part from what I've seen around. I would think that maybe they might have had a spill or something using some kind of chemical in the tank to disperse the oil.

Like I said, there is a private contractor that operates there. It's Federally funded through the EPA, but they do use chemicals, called slick water and rapid water. A lot of the fire departments use that around here. It's oxygen depleting stuff, so that they can get more water through the hoses and stuff, and not feed fires. It's used in the waters. And possibly something to that effect that could have been used. It could have been a high concentration. It could have been spilled down the storm drain, for instance, and had a massive kill in just of a couple of hours, because as

these other scientists and biologists said, that they could not find enough levels of oxygen that was depleted enough to kill these fish. It's very well possible that there might have been a high concentration of this rapid water or something to that effect, spilled in the water and that killed the fish that evening or early in the morning, whenever it did happen, and then it became diluted by the massive quantities of saltwater. It's very well possible.

SENATOR GAGLIANO: How does that work, Les? What is it? You said that it's a flume tank and--

MR. LAYTON: Yes. There's a large, large tank in there.

SENATOR GAGLIANO: Where?

MR. LAYTON: Right at the base of Earle Pier. It's probably about 400 or 500--

SENATOR GAGLIANO: Under the pier, in the pier, on the pier?

MR. LAYTON: No. It's right at the base of the pier, inland, about 400 or 500 yards. You can see it from the waterfront. And it's a large concrete tank that's about six or eight feet high and it's about a quarter of a mile long. They have pumps and stuff in--

SENATOR GAGLIANO: The tank is a quarter of a mile long?

MR. LAYTON: Approximately that long.

SENATOR GAGLIANO: Whew!

MR. LAYTON: And they can re-introduce current flows, wave actions, and stuff.

SENATOR GAGLIANO: For testing purposes?

MR. LAYTON: For testing purposes.

SENATOR GAGLIANO: Oh, okay. I couldn't figure it. I see what you're saying.

MR. LAYTON: They put oil and stuff on the top of the water and they try to disperse it and see what happens to this

oil and other things in the water. They are just doing a scientific study. They could have been using rapid water which I'm familiar with by being with the fire department and stuff. Rapid water depletes all the oxygen in the water. And they might have been using something to that effect -- trying to disperse the oil on top of the water. It's been there for a quite a few years.

And hey, I'm not a scientist or nothing. I'm just trying to draw a conclusion and trying to help out, because I'm a commercial fisherman. I'm the only gill netter left in Belford. Out of 25 to 30 gill netters, I'm the only one left. And I'm trying to stick it out. I don't make a lot of money, but I make a living. And the pollution is killing me.

This summer the price of bluefish just went down. It's just terrible. I brought \$5000 worth of nets this summer. I didn't even hardly pay for it. I'm trying to pay my bills and pay for my nets at the same time. But this pollution scare is really having a devastating effect on fishermen. That's why I'm here.

SENATOR GAGLIANO: Yeah. I met with party boat fishermen the other day. They are really in bad shape. For example, in Belmar, Belmar requires that that they pay in advance for their boat's berth for next year by November 1. It's something like \$6600 to berth the boat. In addition to that, most of them have payments of \$3000, \$4000, \$5000 a month.

MR. LAYTON: Well, anybody in the business -- most of us do have payments.

SENATOR GAGLIANO: Right. They have payments in advance. They double or triple their payments during the summer so that they don't have these huge payments all winter. They haven't been able to do it.

MR. LAYTON: It's a big spiral and it's hurting everybody. One thing I'd ask you people, when you do draw a conclusion or something, that it would be done in some kind of

manner where it wouldn't hurt the people who are trying to derive their income off the water. The floatables and stuff this summer on the water had a devastating effect on us and in actuality, they don't have nothing to do with the pollution of the fish. But once someone is at the seashore and sees something floating in the water, whether it's a syringe or medical waste--

SENATOR GAGLIANO: Or they see it on television or they see pictures of it in the papers.

MR. LAYTON: Yeah, television-- They concluded that if the water is dirty, the fish are bad. We've had fishermen do tests in Cape May on bluefish and they found acceptable levels, they found some that were over. I have a scientific collecting permit, and I've been donating striped bass to the Marine Science Consortium. The other day I threw 2000 pounds of striped bass overboard. I can't sell them because of the PCB scare. We used to be able to take them and sell them and stuff. Now, all I can do is donate them to the Marine Lab so that they can do studies on PCBs and on other things, because the striped bass are in such a decline-- Well, the other day they were in such a decline, but that's another matter.

But that's why I'm here. I'm just trying to help. I have my future in the rivers. I'm a Highlands clam digger by trade. I work in the summertime at Belford. I'm a member of the Co-op. I have a small fishing boat. And we're getting hurt real bad.

SENATOR PALLONE: Let me-- Go ahead.

SENATOR GAGLIANO: Excuse me. Just let me take something from what Lester is saying. I think what we all have to do, starting this winter and think about it for next summer, is to be very careful in how we handle the publicity that comes as a result of whatever is found. We are literally going to destroy tourism, ocean related tourism in New Jersey if we continue to have the bad publicity. You know, it's true you're

supposed to publicize, I guess to a certain extent, problems along the shore. But what we've done-- All of this has had a devastating effect. When I listen to these party boat owners who told me that-- One man told me that he went down south and bought a brand new boat. As he was coming up here, the first scare hit -- the first problem on our beach -- with floatables; and I guess it was probably medical waste, Frank. By the time he arrived in Belmar and tied up his boat, he was doing 30% of what he had expected to do for the rest of the summer. And as a result, he now has payments of several thousand dollars a month that he can't meet on a brand new boat that cost him \$330,000. And that story, I'm sure, is told all the way from Belford to Cape May.

MR. LAYTON: That's just some of it.

SENATOR GAGLIANO: And it's had a devastating effect on the tourism in New Jersey -- the motel occupancy, the apartment rentals that have been canceled, all of those things, you know. And it's really beginning to worry me, because sometimes this becomes like a syndrome. As soon as you see something on the beach, you've got to say that the entire ocean is dirty, and that's not true. We have problems. But I think what we've got to do is to have a real educational process, but also, a lot of these floatables we have to pick up. We really have to use our trollers to pick up floatables as much as anything.

MR. LAYTON: Yes. I believe there was an experiment to that effect last summer.

SENATOR GAGLIANO: I know there are a couple of them that they are experimenting with. It would seem to me that we've got to do that. And somebody said, "Well, it's very expensive." Well, what's more expensive than losing the tourism trade on the shore? And when you balance it, what's the cost of a half dozen trollers that would be out there 24-hours-a-day picking up anything that comes out of that bay?

And I think it's pretty much been proven, that most of our problems emanate from up above and they come down through the Hudson, through the bays, and out.

MR. LAYTON: The media has a lot to do with it. I agree with that, too. My biggest pet peeve right at the moment is throwing back thousands of dollars of striped bass the other day. There's a PCP scare with the striped bass -- that they are polluted. And the bottom line-- The scientist that I read in the paper said that if you eat more than one meal a week for the next 20 years, you may get cancer. Well, I don't think anybody eats more fish than me -- probably two or three times a week -- a lot of times during the summer and I've had some striped bass this week myself. But nobody reads the bottom line. They just read the headlines. The bottom line says that "You may; after 20 years." It's oversensationalism -- some of it.

SENATOR PALLONE: Yeah.

SENATOR GAGLIANO: Yeah. We've got to look out for that because we're bankrupting some very good stable businesses. One fisherman I talked to, his father before him had a charter boat. His father was in the first group of people to tie their boats in the Belmar Basin when that was built. That's fifty-some years ago.

SENATOR PALLONE: Tom, was this the person who lives in South Belmar?

SENATOR GAGLIANO: I'm not sure.

SENATOR PALLONE: Because when I was down in Belmar over the weekend, I was talking to some of them and they mentioned that they met with you.

SENATOR GAGLIANO: Yeah. I'd say about 10 or 12 of them met with me; and I'm trying to arrange EDA loans for them so that they can get through the winter. That's a terrible thing to have to do. They are a group of people who don't

complain and don't cry. They make a living and they pay their bills.

MR. LAYTON: We have the same similar situation in Belford.

SENATOR GAGLIANO: Pardon?

MR. LAYTON: We have some of the same similar situations in Belford. It's been a port that's been in operation for a long time. Some of the younger fishermen are moving, going to Carolina, Florida. My father and grandfather have been clammers and fishermen all their lives and I've tried to follow in their footsteps. I have a two-and-a-half year old son and I don't know what he's going to do? I'm not advising him to go into fishing right at this moment. I'll tell you that.

SENATOR GAGLIANO: Okay.

SENATOR PALLONE: Let me just ask you before you step down, did you or any of the other fishermen actually witness anything that brought on this fish kill? I mean, did you see anything that would indicate to you what might be the cause, other than what you mentioned to me as a possibility?

MR. LAYTON: No. I myself just rode down into the Leonardo area -- there's a parking area around the beach there -- just to observe some fish up on the beach myself. I didn't hear it exactly at the time. And being a fisherman of a co-op, as a small group of fishermen, if there was an accident or something like that, it usually gets around where it happens, you know. And like I did say, if it was an operation of a pirate, if you will, it would have been further offshore and not with that magnitude of fish. So, I'm just trying to, like I told you, draw my own conclusions.

SENATOR PALLONE: Yeah. I was just wondering if there was anybody-- I hadn't heard any testimony by either of the two people who spoke before you, about anybody commenting on the incident in any way. I don't even know if they interviewed anybody? I'll probably ask them that.

MR. LAYTON: I've heard the same things over and over; that it could have been this or it could have been that. Like Leonardo Harbor is right there too. Somebody could have spilt something in the harbor right inside there and something could have spilt. That's the only thing that I can conclude.

SENATOR PALLONE: But nobody saw any oil or anything like that on the water or anything out of the ordinary?

MR. LAYTON: That next day by the Highlands bridge I saw a long streak of foam on the water. I wasn't sure that wasn't what we call a tide streak or a froth of foam of a jetty or something to that effect, but it was a long, long streak, and it was exactly the next day. Then, I believe, there was a kill up the river. But with slick water, like I'm talking about, this oxygen depleting stuff, it stops all the foaming and stuff on the water. It just knocks the air bubbles out. The oxygen in the water just drove out of the water. So, it wouldn't really be that, you know. Like I said, I'm not a scientist.

SENATOR PALLONE: I just wondered if you saw anything? What about the Ideal Beach incident? Was there any--

MR. LAYTON: I don't know anything about it. I didn't even go up that way or anything. My biggest concern was Belford, right in my area, it's about right on my doorstep. We're on the other side of the ammunition pier. And I just saw a few fish on top -- I mean on the beach and stuff. I really couldn't draw a conclusion. But by working on the pier and knowing that the tank is there, I tried to draw conclusions that it could have been this or it could have been that. In the back of my mind, that would be the most logical thing, because it was such an isolated incident and done at such a magnitude so fast that it would seem to be something that was spilt and then dispersed. That's the only thing I could think of.

SENATOR PALLONE: Okay. Thanks a lot. Thanks for testifying. Mr. Anthopulos?

CHRIS ANTHOPULOS: Can I come up?

SENATOR PALLONE: Sure. You can come up. You have to come up here because we have to record what you say. Please give us your name, although I know it.

MR. ANTHOPULOS: My name is Chris Anthopulos and I'm a commercial fisherman from the Belford Co-op. On this particular day -- this is the day before the fish kill -- the Amy Diane left for an evening trip. When he reached the sea bouy at Belford he noticed this heavy slime or foam. And he ran through it and he was talking on the radio. He say's, "I'm running through something here that looks like foam and there's no odor to it." And he went to the Hook before he ran out of it. The very next day there's a fish kill in Leonardo.

When we leave in the morning in our creek, all against the bulkhead is something that looks like hydraulic oil blowed up, and it's a foam two to three inches thick. As we're going down the creek, I notice that same stuff going down to the beach towards Leonardo. But when we got off to the second set of buoys, there was no more foam, but that night before, the Amy Diane had it from the bell buoy to the point of the Hook.

So that morning, we went in behind the Navy Pier and we didn't see none of this. But when we got in there right off the bell buoy, there's two buoys in Leonardo -- you can see a little trace of that going up along the beach. And that's all there was there. I know there was nothing to the south.

Now, to me it look like a pumped out job from Earle. That's the only place it could come from. And it looked like hydraulic oil. It was a foam of two to three inches thick, and it was in our creek. But the next day it was gone. Now where did it come from?

SENATOR GAGLIANO: I don't know.

MR. ANTHOPULOS: I don't either.

SENATOR GAGLIANO: I can't remember whether Mr. Wilk or Mr. Halgren said there was a chemical--

MR. ANTHOPULOS: Then there's another thing in our creek. We went in there one day and the water is brackish on the outside. We come in the creek and the water is so green that you pull a line through the water and it's still green. Now what's that? Where did it come from? But you can talk about the EPA and all of that. There's never no studies made.

SENATOR GAGLIANO: Does the Co-op ever call people in when you see that kind of thing?

MR. ANTHOPULOS: We had the sewer line-- When they was pumping onto the barge, we saw them blow that stuff right in the creek during the night on the outgoing tides. Something happened. Whatever happened, happened. But we saw it going into the creek.

SENATOR PALLONE: Does this, Mr. Anthopulos, what you're mentioning-- Does this seem to coincide with what Mr. Layton said about this type of fuel oil?

MR. ANTHOPULOS: This is man; this isn't nature.

SENATOR PALLONE: No, I mean to say that maybe a pump-out from a tank, like the one at Earle? You can't say, I know.

MR. ANTHOPULOS: Anything's possible, but I can't say.

SENATOR PALLONE: Okay.

MR. ANTHOPULOS: So that's what I wanted to say. This business is done by man, not by nature.

SENATOR PALLONE: Okay. Thanks a lot. We appreciate it.

SENATOR GAGLIANO: We believe that. Thank you.

SENATOR PALLONE: Mr. George Carmichael, who's the Health Officer of Middletown.

G E O R G E F. C A R M I C H A E L: No, I'm the Health Inspector.

SENATOR PALLONE: Health Inspector. I'm sorry.

MR. CARMICHAEL: I have a prepared statement. I'll read that first, then I have some additional comments based on testimonies.

SENATOR PALLONE: Thank you.

MR. CARMICHAEL: Ladies and gentlemen, let me take this opportunity as a representative of the Middletown Township Health Department to welcome you to our town. We are sorry that this meeting was called in response to a major environmental incident that occurred on our shores, a fish kill of a magnitude that will affect our fishery stock for some years to come.

Whether this fish kill was caused by man, by nature, or a combination of the two, it will nonetheless point out the delicate balance of our estuarial waters and the many factors, both natural and man-made, that can quickly form a prolific breeding and feeding ground for fish into a death trap for those same fish.

My knowledge of the events is as follows: The weather in the proceeding week or more had been hot and sunny, with temperatures hovering near the 100 degree mark. Water temperatures in the bay had been steadily climbing until the surface temperature was about 85 degrees. Very little wind or rain during that time made conditions ideal for an algae bloom.

Our first report of such a bloom came on Tuesday, June 21, 1988, at approximately 2:00 p.m. We received a call that there was a brown scum washing up on the beach in Port Monmouth. An inspection of beaches that day revealed a brown foam scum on the surface that dissolved immediately upon striking the shore. The scum ran continuously from the Navy Pier at Leonardo to the beaches in the Boro of Keansburg, and possibly further. No sign of this brown scum was found on the other side of the Navy Pier. Since the brown scum was alternately described as raw sewage or a brown tide and was of

an unknown nature, the beaches were closed to swimming at that time until tests could be run.

The sample results indicated moderate amounts of fecal coliform in the water, as high as 170 per 100 milliliters where 200 is the maximum allowed for swimming. But those same samples also showed the water to be what the laboratory described as "algal soup" with algae counts too high to measure. I remember commenting at that time, "If this is a brown tide, we're going to have one hell of a fish kill."

As I noted previously, the brown tide of Tuesday, June 21, was west of the Navy Pier, but the fish kill discovered June 23 was east of the pier. Since the Navy Pier acts as a breakwater to divide the Raritan Bay waters from Sandy Hook Bay waters, it is likely that a brown tide in the Sandy Hook Bay region was delayed by about a day before it hit Leonardo. Indeed, water samples taken the morning of June 23 in Leonardo were as high in algae as those taken on the beaches in North Middletown and Port Monmouth on June 21 and 22.

A call was received about 1:00 p.m. June 23 stating, "Thousands of fluke were washing ashore by Leonardo Avenue in Leonardo." I was contacted by beeper, and I reached the scene about 1:30 p.m. and saw a sight that brought tears to my eyes -- uncountable thousands of fish, mostly fluke, were being washed ashore by the incoming tide. Since my car was not equipped with a radio, I flagged down a passing Road Department truck and called the Health Department and asked them to notify the DEP, the Marine Laboratory on Sandy Hook and whoever else should be notified.

The representatives from the Marine Laboratory and the DEP were there within an hour. Samples of water and fish were taken by those experts at this time. I did not have sampling equipment with me.

The next morning I inspected the site at low tide and found the kill to be even larger than I thought the previous

day. The beach between the high and low tide marks was literally paved with dead fish. I walked more than 100 yards along the tide line without ever touching the sand. The bodies of dead fluke and other bottom dwelling fish and crustaceans were piled at least three thick over the entire stretch of beach. I estimated that there were a million dead fish on that beach. One local resident who saw me said tears were dripping off my jaws. I hadn't noticed.

I tried to arrange to have an emergency crew come and clean up the dead fish, but arrangements for the cleanup could not be completed before high tide and the cleanup actually started Saturday morning. On Saturday, a small crew, including myself, filled an eight cubic yard dumpster with dead fish. The remainder of the dead fish and some seaweed that washed ashore with the same tide was removed Monday.

A survey of the bay was conducted on Tuesday, June 28. We took water samples and obtained biological specimens and it indicated to us that the waters at that time had recovered from the incident and normal life had resumed in the bay. However, if the brown tide of Tuesday, June 21 through Thursday June 23 was indeed, the cause of the fish kill, as I think likely, a repetition of this fish kill could happen any time temperature, wind, and rain conditions reoccur. If man-made pollution enters into the picture, it is by providing nutrients necessary to an algal bloom.

Certainly, if we are to prevent another fish kill, we cannot control the weather factors. All we can do is to try to minimize the presence of those nutrients with proper sewage disposal, control of farm fertilizer runoff, and possibly controlled dredging and other operations that stir up bottom sediments.

The brown scum that was described by the previous witness, Mr. Anthopoulos, is exactly the same sort of brown tide that we saw on the beaches on June 21. We didn't know what it

is. I have seen brown tides, I have seen red tides. I have not seen anything of this magnitude previously. I had been working as a Health Inspector in Middletown for 17 years. I've been a recreational fisherman in these waters for over 40 years. I have never seen anything of this magnitude when it comes to a brown tide.

The waters where the fish kill occurred are shallow and warm. At low tide, the area where the fish kill occurred is less than three feet deep. It's an area that is locally known as the "Nursery" or the "Hatchery." For a number of years it's been an excellent fishing area, with many, many of the fish present in those small waters feeding primarily on grass shrimp in the area. It would not take very long for oxygen to be totally depleted in that small area. Why the finfish would not have had sufficient warning to move out of that area, I cannot say. Possibly, it occurred so quickly that they simply fell asleep and died. If there is another chemical aspect, I do not know what it could be.

SENATOR GAGLIANO: The brown tide was not identified.

MR. CARMICHAEL: The brown tide was definitely algae. But what the exact species it was, our laboratory was not equipped to answer. I was hoping to get that answer from some of the experts here. It did not appear to be a red tide which would be dinoflagellate, but probably another phytoplankton. Normally these tides are not harmful to finfish except that during this you can get oxygen depletion type situations. But there have been incidents reported on Long Island of brown tides killing fish before. I don't know the exact details involved, but I have heard of incidents of brown tide killing fish before for other chemical reasons -- that they produce a waste chemical. Whether this is the same species or not, I'm not an expert to testify.

SENATOR PALLONE: Do you have any reason to believe from what you saw, Mr. Carmichael, that there might have been

some chemical or petroleum element? Or you just can't really comment?

MR. CARMICHAEL: I saw no evidence of petroleum element. We did try to get a sample of the scum. There was no evidence of oil present. Okay? The scum almost immediately disappeared while trying to sample it. And we could not obtain a sample that the laboratory could identify as containing oil.

SENATOR PALLONE: What could be done, do you think in the future, in terms of making this kind of analysis? I mean, you seem to think that maybe you were going to rely on the other agencies or maybe there was some way to do some better analysis through the State or county?

MR. CARMICHAEL: Well, I think we ought to have an agency responsible for answering immediately to fish kills. They ought to have the necessary equipment to take fresh samples that could be tested for chemicals. I have a degree in chemistry. I understand how difficult it is to take samples. If you wait any period of time, the samples are no longer satisfactory.

It may have been, I would estimate, that the fish kill probably occurred in the early dawn hours based on tidal-- The tide had just shifted to come in at about one o'clock when we first got the call. It was an outgoing tide during the morning; the fish would not have washed ashore at that time. They would have washed ashore on the incoming tide when we received the report.

I did hear rumors -- I have not been able to substantiate with any person who saw it -- that crabs were climbing out of the water at about 5:30 a.m.

SENATOR PALLONE: We read that in the newspapers.

MR. CARMICHAEL: I have not been able to substantiate that. All I can say is that I heard rumors to that effect. But if they are true, it would seem to indicate a time element of the kill -- which would agree with tidal time also. That would have been about flood tide before the receding tide.

SENATOR PALLONE: Okay. Any other questions?

SENATOR GAGLIANO: I have no questions. Thank you.

SENATOR PALLONE: Thank you very much. We appreciate it. Unless we have someone else who wants to speak, I'm going to ask our first two representatives to come up again.

Mr. Halgren and Mr. Wilk, could you come up please? I guess my initial problem is that I want to get a better handle on-- And again, I'm not trying to implicate anybody. But, I'm just trying to get a better handle on what the procedure is in terms of who takes the responsibility in these situations to follow up on the fish kills, to do the analyses, etc. I got the impression from Mr. Wilk that you're not really the lead agency, that rather it's the DEP that's really the lead agency in this situation. Would either one of you care to comment on that?

MR. WILK: Can I comment?

SENATOR PALLONE: Yeah, on how it works between you and the local officials?

MR. WILK: We've had a really wonderful relationship with the State agencies as well as the other Federal agencies throughout my career. In many cases, it's just not enough people to go around, and the agency that receives the call may not necessarily be in the vicinity or may not have a facility. This one was very close to where we live. It was very far away from where Bruce lives. He called me and asked me if I would send a cast of characters there, and I said yes. We've always worked in that way.

What we've done after the fish kill and the several other calls -- some real and some perhaps imaginary calls -- is we've put together a procedure that we will follow, that my group of scientists will follow. It's a simple protocol. We'll have the certain expertise available to go along on the fish kill; you know, a chemist, pathologist, a fishery biologist. We will also have a series of normal standard tests

that we'll take -- water samples and tissue samples and so forth -- if we can make them. As, I said to you before, if it's a dead and dying fish, we would have definitely done organic analyses. These fish had been dead awhile.

So, that's basically what we anticipate doing. I don't anticipate getting a phone call from somebody in Cape May and sending a group of people down there. I don't know what the answer is? Perhaps it requires a coalition of all of our expertise, both State and Federal agencies, working together to have some kind of a response team. We've been involved with response teams before, but they've been primarily those associated with oil spills. Certain people had certain expertise and they could be at a site within a day.

SENATOR PALLONE: How does that work? Give me an example. When you say "response team," is that a set procedure like an oil spill response?

MR. WILK: Yeah. Exactly.

SENATOR PALLONE: How is that set up?

MR. WILK: Obviously, you have a lot of different interests involved. You have the natural resource interest that both our agencies represent. You also have public health agencies. Our agency is not a public health agency. You have environmental people, the EPA and so forth. Everybody has or would like to be part of the investigation and usually the aftermath of the investigation. Primarily within the oil spill response business we had people who were oceanographers. We had people who were chemical oceanographers. You know, all sorts of oceanographers -- chemical, physical oceanographers. We had people who dealt with marine mammals. We had people who dealt with marine birds. And we had-- I don't remember who coordinated it. I think it may have been the Fish and Wildlife Service.

SENATOR PALLONE: But, what I'm saying is like with the oil spill situation, you basically have met and designated people--

MR. WILK: We have designated people who have designated responsibilities and who are on call 24-hours a day. And they had their little kits and their cameras and whatever they needed to go off in a hurry.

SENATOR GAGLIANO: Could you put something together like this for the Sandy Hook Bay estuary?

MR. WILK: I don't think there would be any problems with that. I mean, we're so close -- we could be there, in that estuary, within less than an hour at any given point. And if we went by boat, we could be there in less than a half an hour.

SENATOR GAGLIANO: My personal feeling is that that's probably the most fragile and the most abused in the general area of the New York Bight and that we should be ready for it. Should it happen again next summer-- Maybe we'll have more answers as to why it happened.

MR. WILK: Basically, we've discussed this on our own, and again, we've come up with a protocol that fits what we have available in terms of expertise and what people would like to see collected. The report and the things that we did regarding the Leonardo fish kill -- if we had known that this was going to happen, we certainly would have done things perhaps in a little bit more refined fashion. We would have had a check list. We would have had the appropriate equipment ready to go instead of having to look for it -- not that I think we would have missed anything. It would have been a lot easier.

We would have had a single form that could be processed and so forth; and a single individual to answer questions. So, we do that routinely -- have a single individual. That's the worst possible thing you could have -- six people answering the questions from the press or from people such as yourselves. You're going to get six different answers. It's the old story of the six people in six chairs and you tell one thing at one end and you get a different thing

at the other end. But I think we could come up with something. We already have. I think if--

SENATOR PALLONE: All right. Maybe what we can do, Senator Gagliano, is that if we can ask you -- and also we could have Len (referring to aide) send a letter on the behalf of the Committee to the DEP Commissioner; and you operate under NOAH, I guess -- to basically, you know, request on behalf of our Committee, that we get some sort of response team. That we're concerned about the reaction to the fish kill in Leonardo and the procedures that were followed and that we would like to see some sort of response team put together where in the event this type of incident happens again next summer or at any time-- And we could ask you to follow up on that and get back to us. In the meantime, we'll bring it to the attention of the Commissioner. I don't even know what the title of NOAH is? Is he the commissioner also, or the director?

MR. WILK: The Secretary of Commerce.

SENATOR PALLONE: Secretary of Commerce in that case.

MR. WILK: We do have lower levels that would be happy to deal with it.

SENATOR PALLONE: Okay. That's what we would like. We'll send a letter off to that effect. But if we could get some sort of response from the two of you in the form of what would be done next time and what kind of response team can be put together.

But let me ask you, Mr. Halgren--

MR. HALGREN: Okay. Let me just respond to that.

SENATOR PALLONE: Go ahead, because I'm still not sure about the procedure.

MR. HALGREN: Let me just respond to that also. For one thing, whenever we get a call anywhere in DEP on a fish kill, generally it comes to our division. Our basic policy -- and again, it can depend on locality -- if it's close to your station, one of our scientists or one of our biologists go

right out. But our typical response is that we will try to use representatives from our enforcement unit to get there first. They're generally more dispersed around the State and they have direct radio contact most of the time. Then depending upon what they find, we will react. We do have a locker set up for fish kills with various types of nets and the necessary equipment to take the dissolved oxygen samples, salinity, some of the other more standard chemical analyses for the water along with coolers and ice packs and so on in case we need to take fish samples. We generally try to make an estimate of the size of the fish kill, depending on the area. We may or may not take a boat with us. Again, that depends upon what's at the station at the time -- what kind of personnel we have at the station at the time.

SENATOR PALLONE: But obviously, from what you indicated before, this isn't working too effectively. In this particular incident, the specimens weren't, I guess, put on ice, or whatever the term is, and there was no analysis done.

MR. HALGREN: That's correct. There was no analysis done. There may not even have been enough samples taken to truly run the probably very wide gamut of analyses that would have to be done if you were checking for a total unknown--

SENATOR PALLONE: Okay, but what are we to do the next time, Mr. Halgren? We want to see the situation improved.

MR. HALGREN: Again, let me just say that Stu made a determination at the site that the fish were not fresh enough to take chemical samples. I say we do take a cooler -- we do have a separate cooler put away. We have ice packs put away specifically for a fish kill event. In the event where, first of all, you might have a major sized fish kill and where its cause is not readily obvious, those fish would be brought back in as fresh condition as possible, and frozen.

SENATOR GAGLIANO: Part of your response team, it would seem, would have to be also the ability to contact the

lab where you're going to send the fish and be able to pay for it.

MR. WILK: Can I say something along those lines, Senator?

SENATOR GAGLIANO: Sure.

MR. WILK: In terms of analyses, if tissue samples-- If one were to look at the EPA list of toxic chemicals, it's three or four long pages in very small type. In order to do those kinds of analyses, with the sample sizes necessary, you're asking for a lot of work that may prove to naught. You may never find it. It takes for instance, a good laboratory or a good organic laboratory, like the one the Food and Drug Administration has or like the ones that we have within our system. They can do between 20 and 40 samples a week of organic analysis. They can do perhaps 100 inorganic samples a week. This is a very time-consuming methodology. It's not a "stick and probe," if you understand.

SENATOR PALLONE: I understand.

MR. WILK: And to look at that whole area of different element compounds and everything and some perhaps that you don't even have on your list or in your computer bank, is very time-consuming and perhaps, it wouldn't prove much at all, particularly with the prior knowledge that the animal has been dead for a while. The enzymatic reactions and the water temperature and oxidation just play havoc with organics.

SENATOR PALLONE: See, my only point here today is that knowledge, I guess, is a value, if that's the simplest way to put it. And I think the biggest problem that we have is that there's no conclusive evidence at this point as to the cause. And it doesn't appear that we're ever going to have one. So, there are three things that struck me based on the testimony this morning:

1) Mr. Halgren's statement that perhaps there wasn't enough money available initially to have the equipment or to do some of the analysis;

2) that we perhaps need some sort of response team or some kind of coordination for a quicker response; similar maybe to what you do for oil spills;

3) I think we need -- I think you suggested it, Mr. Wilk -- some sort of long-term study which you said would be very expensive.

And maybe-- You know, I don't know how expensive? I didn't ask you for a ball park figure -- to just basically study what's going on in the bay and that whether or not these fish kills are liable to reoccur; to look at them in the long-term as to what's causing the red tide or whatever. I don't think we're going to be here much longer today, but I would like to do some follow-up on those three areas. And Len, you're taking it down. My main concern is, I'll repeat it again: I want to see what can be done with regard to Mr. Halgren's statement that perhaps there wasn't enough money allocated for this.

I honestly believe that that's the DEP's fault, because it's not a question of the Legislature not appropriating the money. And if we could see some sort of coordination to some sort of response team, because we have no reason to believe this isn't going to occur again, and then what about some sort of long-term study? Now, you were hinting about this kind of long-term study of the problem in the bay. Give me a little more information about that.

MR. WILK: Okay. Let's look at one potential cause of the incident. If one starts at the lowest tropic levels and works oneself up, the most important link, the last link, is between man and the resource. We have done resource work before in the estuary where we have looked at the resources. We know what's there. We know what's there on a seasonal basis, at least historically. Those kinds of endeavors have to be part of the other measurements that are done concurrently. In other words, if you're interested in dissolved oxygen and

its effect on the distribution, abundance, and perhaps mortality or the displacement of species, you have to measure the fish and dissolved oxygen simultaneously at some rate that you are confident will give you enough resolution to be predictive, to be able to say that this set of situations causes this effect. That's just one thing.

Now, if you want to look at all of the other potential causes or instances or whatever you want to call them, you have to start bringing in chemical analyses of all sorts and shapes. You've got to look at the effects of all of these potential man-induced or natural causes on the total eco-system and how that magnifies or relates to the living marine resource, which is the thing that we're, perhaps, most interested in.

These types of studies have been done before in other areas. They're of long duration, and in many cases, they have not proven to be highly predictable. And I think that's what you're asking for. You're asking to have something in place that is going to say, "Listen, W, Y, and Z has just happened; the chances are 50-50, 60-40, or what have you, that we're going to have a fish kill." And then, so what? You're going to have a fish kill. You can't prevent it. What you have to do is go back beyond that and figure out what is causing that series of events and eliminate it if you can. And I don't know how you do that? So, it's a bigger than Dallas problem.

The other thing -- and I just want to make one statement about that -- is that the fish kill that we witnessed here will, for any reason at all, will have no effect on the total population of those species of fish. And I say that with complete confidence. Those fish, although they were numerous, although there were of different varieties and what have you, make up one very, very small part of the total population of those species found along the coast; not in New Jersey, but coast-wide. So, it's a troublesome situation, but it's not

having lasting effects on the population levels of those species.

SENATOR PALLONE: Okay. Just so that I understand again, though -- the DEP is definitely the lead agency in this situation. Correct?

MR. WILK: Yes.

SENATOR PALLONE: All right. What about the EPA? What is their role? There's nobody from EPA here today. Did they get involved in this in any way?

MR. HALGREN: They did. They did a lot of the water chemistry work for Water Resources in that incident. And they typically are out there looking at water quality, primarily the water chemistry, DOs, and that sort of thing.

SENATOR PALLONE: Okay, but in other ways, the only reason why Marine Fisheries got involved, was because you asked them to -- because they were close by.

MR. HALGREN: That's correct.

MR. WILK: We would have responded if every John -- if every citizen would have called to say that--

SENATOR PALLONE: So, in other words, you would respond if they had called, but you were also doing this for the DEP, because you were close by.

MR. WILK: We received a phone call after I talked to Bruce on the phone. I think the same gentleman called us.

SENATOR PALLONE: Okay. And then as far as the EPA is concerned, they also-- You would also call them in to help then as well.

MR. HALGREN: Under normal circumstances; yes. They were in the area anyway the day before, and they were called in by the Department on the day of the fish kill and asked to do specific chemical analyses -- water quality analysis at specific times. Again, I think that's probably where the initial comments relative to the fish kill possibly being caused by dissolved oxygen came from. The data came from EPA

showing an intensive algae bloom -- super saturation of oxygen in the daytime and quite low levels in the morning. I can understand the fairly normal reaction to say that, "Okay, I see the situation. They are unique. It was a very dense algae bloom, therefore, there's a strong likelihood that it could have been a low oxygen level that created the fish kill." Our Division did not say that.

SENATOR PALLONE: Okay, but in other words, if we were talking about coordinating some sort of response team, you would still act as the lead agency in that regard. But we would have to try to get some coordination with the EPA and Marine Fisheries, would be the point.

MR. HALGREN: I think that would be appropriate. I think that's the way it acts as it is, but if it were put in a more formal manner, I think that's the way it would operate.

SENATOR PALLONE: Okay. Just in general, since we're here, I just want to know, do you want to make any comments in terms of the underlying health of the Raritan Bay, you know, whether or not the situation is getting better or worse?

Then finally, you mentioned, Mr. Wilk, that non-point sources are a contributing factor to the problem. And I know that this Committee has certainly touched on that issue before, and I'm just wondering what measures you would suggest to lessen the non-point problem -- what's been tried in other areas. It's early enough in the day, so I can ask these things, and just get some general observations, which I think are important.

MR. HALGREN: Whether things are improving or not, certainly I would have to say, that they are. I mean, most point source pollution has been addressed quite strongly. There are no longer any major sewage effluents into that section of the bay. I think there's one remaining left up on Middlesex County.

SENATOR PALLONE: That's the Raritan Woodbridge Authority?

MR. HALGREN: Yes. So, I think that's a significant benefit. On the other hand, non-point source pollution probably continues to be a problem and undoubtedly increases its problem as the population increases and the population pressures towards the coastal areas increases. So, on the one hand I think the State, and probably the country as a whole, has come a long way in improving water quality in the interior areas in the coastal rivers and bays from point source type pollution. We now need to look at a much broader concept of actions to reduce potential pollutants from entering the water. Certainly, there's been a dramatic impact in the Chesapeake Bay, and there's a very major Chesapeake initiative to research that area -- to look at potential mechanisms for cleaning that area. And one mechanism, of course, is a good strong land use plan, not just on the waterway, but moving back into the land areas. I think that's important.

I think the Governor has already identified in his 14 point plan quite a number of things that can be done maybe more easily than that, which also need addressing -- storms and all that sort of thing-- I think are very important--

SENATOR PALLONE: What about this Federal Estuary Plan?

SENATOR GAGLIANO: Navesink?

SENATOR PALLONE: Well, there's one for the Navesink, which I know you've been involved in. But what about the National Estuary?

MR. WILK: The Estuary Program?

SENATOR PALLONE: I thought that the New York Bay and the New York Bight was going to be one of the areas that's-- Go ahead.

MR. WILK: There's two programs. There's the New York Bight Restoration Program, and there's the National Estuarine Program. The National Estuarine Program is already in places

like Long Island Sound and the Chesapeake Bay. They are, I believe, going to be moving into the Raritan/Hudson Estuary.

MR. HALGREN: And the Delaware.

MR. WILK: And the Delaware.

SENATOR GAGLIANO: When?

MR. WILK: It should fairly be within our Federal fiscal year. I don't know if you're familiar with this document recently put out by the State of New Jersey--

SENATOR PALLONE: The Governor's panel?

MR. WILK: Yeah. It's "The State of the Ocean" and it's the report of a panel on ocean incidents. And I think that if you were to look through the various recommendations, I think you would get a feel for the magnitude--

SENATOR PALLONE: That's the Governor's Blue Ribbon Panel.

MR. WILK: Yeah. We've had some people who've served on it. You get some idea of the problems and some of the potential solutions. And all of those are applicable to this area, perhaps even more so than other areas, because of the high levels of population that we have surrounding us.

SENATOR PALLONE: All right, unless there's someone else who wants to speak, I just wanted to wrap this up and see where we're going in terms of any conclusions today. I mentioned the three concerns that seemed to be raised. One is a better response team, the second was some sort of long-term study of the problems associated with low levels of oxygen and algae bloom, etc.

SENATOR GAGLIANO: Well, Frank, wouldn't that be addressed by the estuary group over a period of time?

SENATOR PALLONE: Well, I'm not sure. I'm not sure how specific they are going to get?

MR. WILK: There's a whole bunch of lists around as to what the real problems are. The list is anywhere between five and ten that are the most pressing problems.

SENATOR PALLONE: Okay, but what I was suggesting--

MR. WILK: Oxygen levels are usually in the top three.

SENATOR PALLONE: What I was suggesting though was something specifically for the Raritan which maybe we can look into.

SENATOR GAGLIANO: Well, that would be part of it.

MR. HALGREN: I think the first level of funding under that estuarine program is a planning document, and I think that would probably go a long way in getting toward the elements that I believe we're talking about now: identify the problems and looking for long-term solutions.

SENATOR PALLONE: And then the last thing is, you know, the specific concerns that you raised, Mr. Halgren, which I think are the most distressing, really; and that is what seemingly is the lack of funds or lack of equipment to deal with these problems.

MR. HALGREN: Well, it's not lack of equipment. If indeed we were to look at attempting to run a wide-- If we didn't have an idea, anyway, of what the causative agent might have been -- if we had some sort of an idea -- it cuts the cost way down.

SENATOR PALLONE: But I guess what I'm asking you is this: We talk about a response team. Earlier you stated that there was a problem in this case where the fish weren't put aside and the testing wasn't done. It wasn't, I suppose, emphasized enough by the Department or responded to sufficiently. Can that be addressed through this new formalized response team that we're suggesting? I mean, obviously, there's a problem. Senator Van Wagner hit upon it when he was asking you the questions before, and I don't want it to reoccur. And I want to know what the Department can do to rectify it so that they do properly respond next time?

SENATOR GAGLIANO: You don't want the fish kill to reoccur. Obviously, some fish kills are going to reoccur

anyhow. What you're saying is if it happens, you want an immediate response to try to find out why.

SENATOR PALLONE: Because the bottom line today is that we don't have the cause, and it seems to me that we might have been able to have the cause if somebody had gotten there sooner or there had been some way of analyzing the fish to know whether or not it was chemical, whether it was from oxygen depletion, or whatever the cause was.

MR. HALGREN: It's possible. I don't think anybody could have gotten there sooner unless somebody actually noticed the fish kill sooner. I think response on the part of the National Marine and Fisheries Service was about as quick as anybody could get there. The determination was made on site that there's a strong likelihood that those fish were not fresh enough to make good solid organic toxic compound analyses. Or on the other hand, it is something that we are prepared to pick up and freeze in the event that we do feel that they are fresh enough and we don't have another potential cause for that fish kill.

SENATOR PALLONE: Mr. Carmichael, you have to come up here, unfortunately. (referring to inaudible remarks made off mike) Join the panel. I don't know if we have another chair? (Mr. Carmichael complies)

MR. WILK: There's more of us than there is of you, Senator.

MR. CARMICHAEL: One thing that I think that should be tested for is that at anytime we get a report of a massive algae bloom, there ought to be a species identification of what algae is involved.

SENATOR PALLONE: So, what you're saying is if it's found before the fish kill occurs, that there's a potential problem, that that's the time that to maybe intervene and do some testing.

MR. CARMICHAEL: Yes, I believe so.

SENATOR PALLONE: What is the situation with that? You weren't made aware of the problem, I guess.

MR. HALGREN: The red tide organism was identified. So, there was identification of the bloom agent involved.

MR. CARMICHAEL: That was the major one. The second one is that I think there ought to be some sort of response team with necessary test gear available at all times on their vehicle to respond to such fish kills, so that if there are species that are in a state where they are fresh enough -- that samples can be taken. I tend to agree that these fish had probably been dead for six to eight hours, prior to the time that they were discovered, and probably would have already deteriorated sufficiently that testing would not have been valid.

SENATOR PALLONE: All right. What we're going to do then, Senator, is on behalf of the Committee, as I indicated, we're going to ask both of your departments or agencies if we could put together for the future a response team along the lines of some of the suggestions that were made here and then hopefully, you'll get back to us and we'll get some response from the commissioners or whatever, on the issue.

SENATOR GAGLIANO: The response team should include a person who is knowledgeable with respect to the media so that we don't let people who might be coming here from Pennsylvania on a vacation believe that the whole area is totally filled with dead fish and pollution.

SENATOR PALLONE: Yeah. When we're talking about a response team, we're talking about somebody who is going to get at this thing scientifically, not that we're going to be putting it on the airwaves.

MR. WILK: I couldn't agree with you more. I think we've had that informal relationship with the State agencies for at least my whole career. What we have done is that we've put together a protocol which I'll volunteer to send to Bruce

for his perusal and then from there we can send it to your office; you know, to give you some idea of what we consider to be an appropriate protocol. And then I don't know how we can formalize it any more than that. You know, the State and Federal, we've had a very good relationship in many ways. I guess if we just say that we're going to follow a unified protocol, we'd probably be way ahead of the game. I think we've spent a lot of time already, members of my staff, putting together this protocol as well as the check list and so forth. We talked it over without going through the bureaucratic formalities. I hate to say that. They would just slow things down.

SENATOR PALLONE: All right. I appreciate that. Yes?

MR. HALGREN: Just one more point, and it's already what Stu had touched on, and I did see it in the papers. As a matter of fact, we've had a number of people call, wanting to know whether later in the summer, they should still bother to go fishing because the resource was really damaged by this fish kill. I'd just like to reiterate that. You know, a fish kill or a commercial haul of fish looks very extensive. Even several thousand summer flounder, even if it were 10,000 or 20,000, is not a significant portion of the population. In New Jersey alone, we've landed somewhere in the neighborhood of 10 to 15 million pounds of summer flounder annually.

SENATOR PALLONE: Yeah, but the bottom line is that we want to get to the bottom of these things, and even if it's small by your standards, it's large by other people's standards.

SENATOR GAGLIANO: No, what I think he's saying is about the publicity involved with people thinking that every fish in Sandy Hook Bay is dead now, because of the result of a few thousand fish having died on the beach.

MR. CARMICHAEL: One thing I must add is that when I did report to the press in regard to this, I did state that these were small fish, that there would be no immediate

endangerment to the local fishery; you can still go out and catch a fish. I found no reason to suspect that they should be contaminated and couldn't be eaten. And somehow that got deleted from the newspapers.

SENATOR PALLONE: That's interesting. Well, thank you gentlemen for coming today.

MR. HALGREN: That brown slime-- And I was talking to Bob Adenatovich (phonetic spelling) and Chris Anthopoulos, and I think Mr. Carmichael is absolutely correct. That's pretty typical; as algae bloom starts to die, their cast comes to the surface of the water.

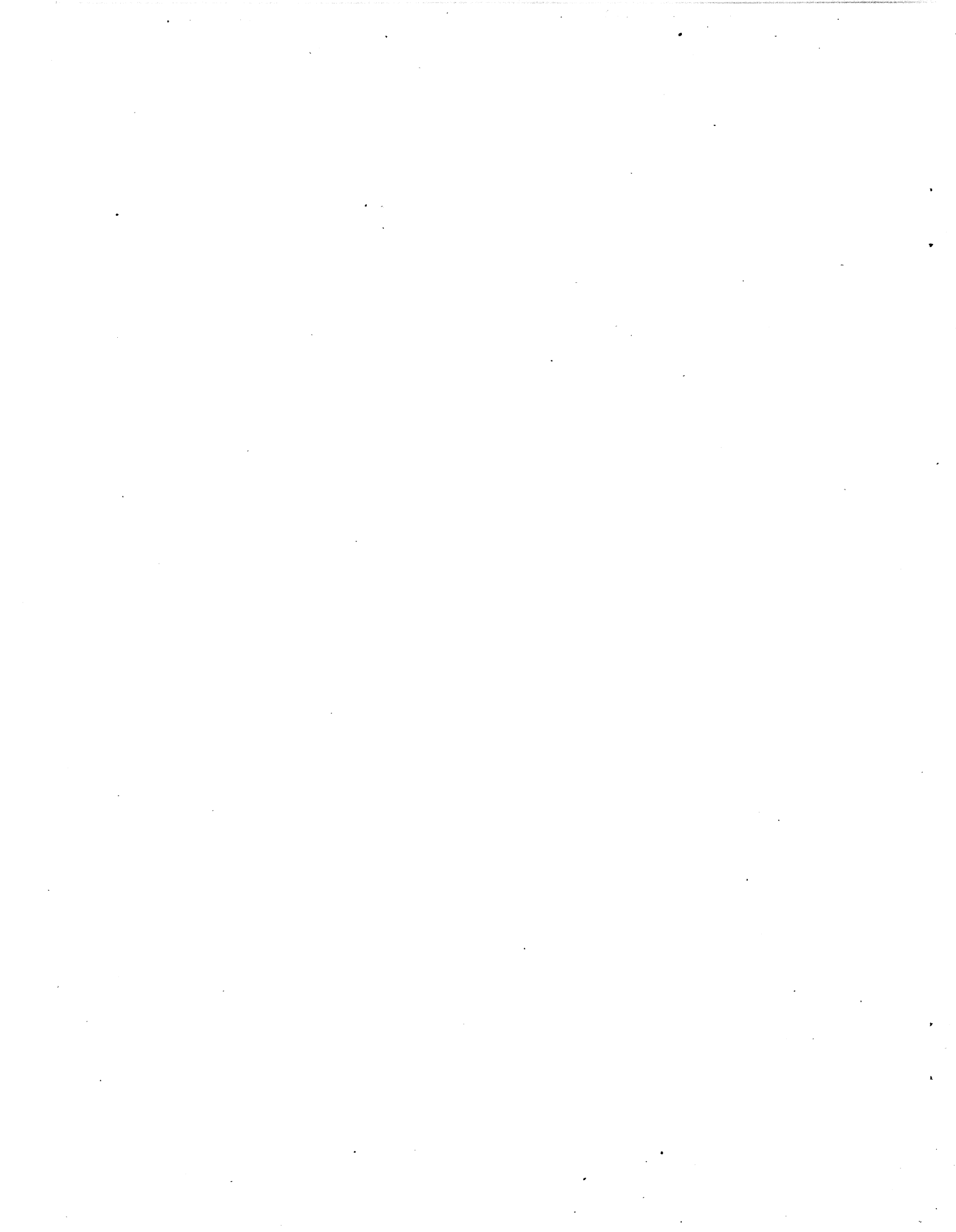
SENATOR PALLONE: Well, thank you very much. I think the bottom line for me is that we still don't have any more information about the cause. But at least, if we can do something in the future so that we can get at the causation, I mean, that's going to make a difference, because I think that's the biggest frustration that everyone has in our area. You know, these occur and we don't know what the reason is. We have some idea, but we don't know the definite reason. And we should be able to get at the cause. We should be able to know.

MR. HALGREN: I believe that frustration exists within the scientific arena also.

MR. WILK: I can tell you it exists in the scientific community. Guarantee it.

SENATOR PALLONE: All right. Thank you very much. I want to thank the people who transcribe this again, as always. We appreciate you coming, too.

(HEARING CONCLUDED)



APPENDIX

STATEMENT FOR THE RECORD

WILLIAM MUSZYNSKI, P.E.
ACTING REGIONAL ADMINISTRATOR
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

BEFORE THE

NEW JERSEY STATE SENATE SPECIAL COMMITTEE
TO STUDY COASTAL AND OCEAN POLLUTION

OCTOBER 13, 1988

In conducting its New York Bight Monitoring Program during 1988, the Environmental Protection Agency (EPA) documented two major fish kills in New Jersey waters. The first and larger kill occurred between June 22 and June 27, 1988 in Sandy Hook Bay. An estimated 1 million fish of all local species died in this event. On July 22, another kill occurred in Horseshoe Cove, Sandy Hook Bay. In this latter event, an estimated 3,000 - 10,000 menhaden died. Fish kills during the summer months in enclosed coastal bodies of water are not uncommon occurrences, but the size of the June kill was unusual.

The causes for these summer fish kills seem to be related to the lower dissolved oxygen (DO) levels found in the relatively warm, shallow coastal waters. Anoxia, the total lack of oxygen dissolved in water, can result after the development of a large algal bloom. As the algal cells die and decay after the bloom has passed, all DO can be consumed in the decomposition process. With critically low DO levels in the water, resident fishes may suffocate and die.

Evidence that critically low DO levels may be causing these fish kills was found after the second event noted earlier. DO sampling in the early morning following the fish kill found levels of 1 - 2 parts per million (ppm) oxygen in the water. A level of 5 ppm is considered generally adequate for fishes. Testing in the morning is significant because it tends to show the minimum DO levels in a water body. This is because DO levels in the morning result from the nighttime period of respiration when algae consume oxygen rather than produce oxygen through photosynthesis. No such DO deficit was noted at the site of the first fish kill; however, the readings may not have been very meaningful because the DO testing was done in the afternoon after the algae may have had sufficient time to raise DO levels in the water through photosynthesis.

/X

While it has not been proven that anoxia was the cause of these fish kills, it remains the most likely explanation. No other cause has been verified for these events. No toxic spill or obvious oil sheen was connected with these incidents, and there are no other reasonable explanations. Fish kill incidents seem to be restricted mainly to state waters in New Jersey; no serious problems are found beyond the 3-mile State limits. Current EPA planning initiatives, the New York-New Jersey harbor Estuary Program and the New York Bight Restoration Plan, will give a clearer understanding of pollutant problems, such as nutrient enrichment, that may be contributing to algal blooms, and ultimately to fish kills in the region.

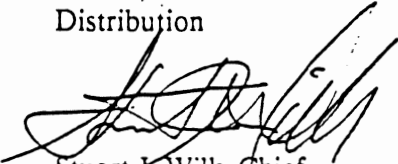


UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northeast Fisheries Center
Sandy Hook Laboratory
Highlands, New Jersey 07732

27 June 1988 F/NEC34: SJW

MEMORANDUM FOR: Distribution

FROM: 
Stuart J. Wilk, Chief
Environmental Analysis Investigation

SUBJECT: Fish Kill - Initial Report

This memo provides an initial report regarding a fish kill in the vicinity of Leonardo, New Jersey.

On 23 June 1988 a team of scientists from the NOAA/NMFS/NEC Sandy Hook Laboratory responded to a telephone call regarding the presence of numerous dead fish on a section of beach between the Leonardo State Marina; Leonardo, New Jersey and the town of Atlantic Highlands, New Jersey (See: Attached Chart). The Sandy Hook team arrived in the area at approximately 1430 hours at which time water samples were taken for microscopic examination as well as for determinations of dissolved oxygen, salinity, and sulfide levels. An examination of ~1.2 km (0.75 miles) of beach revealed large numbers of dead finfish and megainvertebrates.

The following annotated phylogenetic listing gives the species of finfish and megainvertebrates that were observed and their abundance on the beach itself as well as in the surf zone associated with the beach:

FINFISH

ANGUILLIDAE

American Eel (*Anguilla rostrata*) - Rare: Only a single individual was observed.

OPHIDIIDAE

Striped Cusk-eel (*Rissola marginata*) - Very Common: 100's of individuals representing a wide range of sizes (~75-350 mm TL).



ATHERINIDAE

Atlantic Silverside (*Memidia menidia*) - Rare: Only two large individuals (~100 mm FL) were observed.

SYNGNATHIDAE

Northern Pipefish (*Syngnathus fuscus*) - Very Common: 100's of individuals representing all sizes (~75-300 mm TL) were noted.

SERRANIDAE

Black Sea Bass (*Centropristis striata*) - Rare: Only a single specimen was observed.

SPARIDAE

Scup (*Stenotomus chrysops*) - Very Common: 100's of small individuals (~75-125 mm FL); probably young-of-the-year and/or yearlings.

LABRIDAE

Tautog (*Tautoga onitis*) - Common: ~25-30 small individuals (~75-150 mm TL) were noted.

Cunner (*Tautoglabrus adspersus*) - Rare: Only a single small specimen (~75 mm TL) noted.

URANOSCOPIDAE

Northern Stargazer (*Astroscopus guttatus*) - Common: ~15-20 small individuals (~100-150 mm TL) were observed.

TRIGLIDAE

Northern Searobin (*Prionotus carolinus*) - Very Common: 100's of small specimens (<200 mm TL); based on published literature these individuals were most likely yearlings.

Striped Searobin (*Prionotus evolans*) - Common: ~75-100 individuals of assorted sizes (~75-200 mm TL) were noted; these specimens probably ranged between one- and three-years-old.

COTTIDAE

Grubby (*Myoxocephalus aeneus*) - Common: ~50-75 small individuals (~75-125 mm TL) were noted.

BOTHIDAE

Smallmouth Flounder (*Etropus microstomus*) - Very Common: 100's, perhaps 1000's, of these little known small (usually <125 mm TL) left-eyed flounder were observed.

Summer Flounder (*Paralichthys dentatus*) - Very Common: 100's, if not 1000's, were noted; specimens ranged in size from ~200 to 750 mm TL. It should be noted that this species was probably the most numerous and definitely represented the highest biomass of all species observed.

Windowpane (*Scophthalmus aquosus*) - Common: ~15-25 small individuals (~75-150 mm TL) were observed.

PLEURONECTIDAE

Winter Flounder (*Pseudopleuronectes americanus*) - Common: ~50-100 small individuals (~100-150 mm TL) were noted; these specimens were probably young-of-the-year and yearling individuals.

SOLEIDAE

Hogchoker (*Trinectes maculatus*) - Rare: A single specimen ~100 mm TL was collected in the area of interest by Mr. Joe Soltis and brought to the Laboratory on the afternoon of 23 June 1988.

TETRAODONTIDAE

Northern Puffer (*Sphoeroides maculatus*) - Rare: ~10 specimens ranging in size between 100 and 150 mm TL were observed.

MEGAINVERTEBRATES

PALAEMONIDAE

Shore Shrimp (*Palaemonetes vulgaris*) - Very Common: 1000's of individuals.

CRANGONIDAE

Sand Shrimp (*Crangon septemspinosa*) - Very Common: 1000's of individuals. It should be noted that this and the above species of shrimp were mixed together in large tidal rows on the beach.

PORTUNIDAE

Blue Crab (*Callinectes sapidus*) - Common: ~75-100 individual of all sizes were observed.

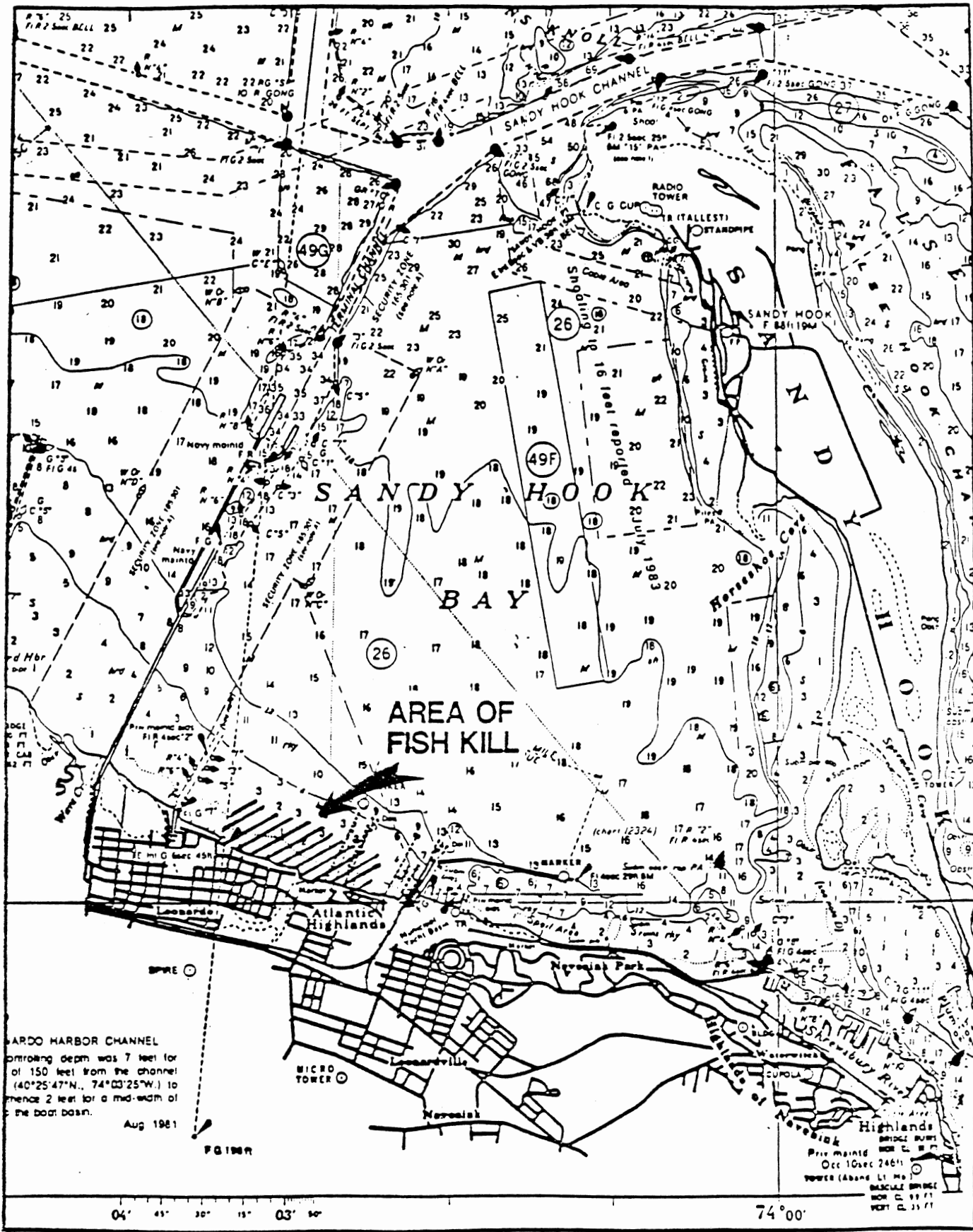
Lady Crab (*Ovalipes ocellatus*) - Very Common: 100's of specimens of all sizes (~50-125 mm CW) were noted.

Water samples taken at the same time as the above observations were found to have >5.0 ppm dissolved oxygen. In conclusion, it was obvious from the state of the fish that whatever caused their death had occurred within <48 hours. It should also be noted that

the aforementioned species represent what might be termed the "normal" demersal assemblage of finfish and associated megainvertebrates which one would expect in a Middle Atlantic estuary during the summer months.

Distribution

Attachment



SANDY HOOK CHANNEL
 minimum depth was 7 feet for
 all 150 feet from the channel
 (40°25'47"N., 74°03'25"W.) to
 increase 2 feet for a mid-width of
 the boat basin.
 Aug 1981

Printed and
 Oct 10 Sec 2464
 TOWER (Aband LI No)
 BRIDGE BRIDGE
 NOV C 19 77
 WEST 2 31 FT

7x



