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UNITED STATES ATOMIC ENERGY COMMISSION

IN THE MATTER OF:



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Washington, D.C. 20002

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RETURN TO REGULATORY CENTRAL FILES  
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UNITED STATES OF AMERICA  
ATOMIC ENERGY COMMISSION

In the Matter of:

• Docket No. 50-247

CONSOLIDATED EDISON COMPANY OF  
NEW YORK, INC.

(INDIAN POINT STATION, UNIT NO. 2

Room 532  
Sixth and Pennsylvania Avenue, N. W.  
Washington, D. C.

Thursday, 18 January 1973

13                   The above-entitled matter came on for further  
14 hearing, pursuant to adjournment, at 9:30 a.m.

SAMUEL W. JENSCH, Esq., Chairman, Atomic Safety and Licensing Board.

DR. JOHN C. GEYER, Member

MR. R. B. BRIGGS, Member.

## **APPEARANCES:**

(As heretofore noted.)

1                   C O N T E N T S2                   WITNESS3                    DIRECT    CROSS    REDIRECT    RECROSS

4                   Chester P. Goodyear

5                   9129

6                   Exhibits

7                   None.

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1                   P R O C E E D I N G S

2                   CHAIRMAN JENSCH: Please come to order.

3                   Whereupon,

4                   CHESTER P. GOODYEAR

5                   resumed the stand, and, having been previously duly sworn,  
6                   was examined and testified further as follows:7                   CHAIRMAN JENSCH: By way of a preliminary matter,  
8                   it is our understanding that for various reasons, the Federal  
9                   Buildings within the District of Columbia may be closed tomor-  
10                  row at noon, and I have been having an informal discussion with  
11                  Applicant's attorney and the other parties, and an inquiry  
12                  was made as to the feasibility of having an all-day session  
13                  tomorrow in Germantown. Inquiry is now being made whether  
14                  that facility is available, either without other conflicts,  
15                  or whether the facility will be made available under any  
16                  circumstances. We will give consideration to this matter at  
17                  a later time.18                  Applicant, Dr. Goodyear has resumed the stand. Are  
19                  you ready to proceed?

20                  MR. TROSTEN: Yes, sir.

21                  CROSS-EXAMINATION (continued)

22                  BY MR. TROSTEN:

23                  Q                  Dr. Goodyear, there were two pending questions  
24                  before you yesterday, one having to do with the statistical  
25                  evaluation of the data contained in the Carlson-McCann report

2mil 1 and the other having to do with your review of the Clark  
2 testimony. Do you have the questions clearly in mind, or do  
3 you want to have them repeated to you?

4 A I think it would be best if they were repeated.

5 MR. TROSTEN: Mr. Chairman, rather than take the  
6 time now, I will have to go back and look for these pages.

7 CHAIRMAN JENSCH: Very well.

8 BY MR. TROSTEN:

9 Q Dr. Goodyear, with regard to Table V-11, which  
10 appears on page V-47 of the final environmental statement, I  
11 want to ask you a few more questions about that and then move  
12 on. In V-11 you will observe there that between the August  
13 11-17 period and the August 25-31 period, the percent of juve-  
14 niles, of young of the year rather, striped bass above Indian  
15 Point went from 0.1 to 30.8 percent. Do you see that?

16 A Yes.

17 Q I gather that this was -- what was the reason in your  
18 view why the percentage below Indian Point and above Indian  
19 Point changed that dramatically, that is by almost 31 percent,  
20 during a one-week period?

21 A Well, there are several explanations for it, which  
22 could be valid. But if you will notice the zone which con-  
23 tributed most to that change in the fraction was at Cornwall.

24 Q Yes.

25 A The salt front at that time of the year was moving

3mil 1 up river and with it, very likely, the striped bass. This  
2 would be the type of thing you would expect from the distri-  
3 bution, from the behavior, of the bass themselves, that they  
4 tend to concentrate near the salt front and the higher abun-  
5 dance of larvae and juveniles occurs in the vicinity of the  
6 salt front. So that that distribution, that change in dis-  
7 tribution, really, would be predictable from that standpoint.

8 Q Does that mean if the salt fronts were to move  
9 north of Indian Point in any one year, that it might have a  
10 similar effect, it might move the juvenile fish up with it,  
11 thereby changing the concentration above and below Indian  
12 Point in a similar way?

13 A Yes.

14 Q Now what portion of the total shoal areas of the  
15 Hudson River which were sampled in July and August, 1968, do  
16 you have any way of knowing that?

17 A I don't know right offhand.

18 Q Would you say it was a fairly small percentage of  
19 the total shoal area?

20 A Well, the total sampling was still a small per-  
21 centage of the total shoal area.

22 Q That is what I meant.

23 A Yes.

24 Q Do you think it is probably that if you had  
25 trawled over a longer period of time that you would have

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1 produced a significantly different distribution than is  
2 shown here; rather than just in July and August of '68?  
3 I am talking about that one year.

4 A Within that one year.

5 Q Within that one year?

6 A If the sample were distributed over more months,  
7 for instance?

8 Q Yes.

9 A I am not sure exactly what you mean by significantly  
10 different. Statistically, I can't say, but I am not sure  
11 exactly what the size of the variance in these samples are.  
12 But I suspect the variance is quite large, and you probably  
13 wouldn't get a statistically significant variation from this  
14 distribution.

15 Q Because the -- the reason for that is what again?

16 A The variation within these samples is quite large.  
17 You would expect it to be. I really haven't examined that  
18 in detail, so I really can't say with any precision what the  
19 situation would be.

20 Q Does that mean that the level of confidence that  
21 you could assign to these values is really not very high? Is  
22 that what you meant by what you just said?

23 A From an absolute standpoint, yes.

24 Q Now if you were to trawl in a different year, instead  
25 of 1968 you had trawled in '67 or '66, do you think it is

5mil 1 probably you would have produced a significantly different  
2 result than the distribution that is shown here, the  
3 percentage distribution that is shown here?

4 A In 1967? Or '66?

5 Q If you had trawled in a different year. I gave  
6 you, as an example, '67.

7 A Yes, very different.

8 Q Now just a summary with regard to this table, Dr.  
9 Goodyear. Again so we can both be clear exactly what I am  
10 driving at here, this table is relied upon by you, as I  
11 understand it, for your assertion on the bottom of page v-40  
12 that in 1968 trawl samples of shoals for the length of  
13 the river showed that 70 to 90 percent of the surviving portion  
14 of the total annual production of young bass had migrated  
15 past Indian Point by late July or early August of that year.  
16 And I assume that this table is the basis for -- I am sorry,  
17 that is the basis for your conclusion, this table is the  
18 basis for that conclusion. Now in view of the fact that the  
19 trawling was conducted just for those three months and that  
20 the trawling was conducted just in that one year, and that  
21 you are relying -- excuse me, let me go back one step.

22 Is it not true that in addition to relying upon  
23 Table 5-11 for your conclusion with regard to the distribution  
24 of the larvae in 1968, that you are also relying upon that  
25 table for your general conclusion as to the percentage of

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1 large organisms that migrate past Indian Point in an entrain-  
2 able stage by July or August? Is that correct?

3 A No.

4 Q It is not correct?

5 A It is not correct.

6 Q Are you relying on that table and something in  
7 addition to that?

8 A This table essentially is a set of data which  
9 supports the hypothesis upon which all of the material is  
10 based, or all of the predictions are based.

11 DR. GEYER: Could you speak a little louder?

12 THE WITNESS: The table itself, just like any of  
13 the rest of the distribution data, as I pointed out earlier,  
14 except for the distribution of the egg production, none of  
15 the rest of the data really are used in the predictions,  
16 only in evaluating the relationship, really, between the  
17 predictions, the predicted distribution for a set of data,  
18 and the situation that actually occurs in the river.

19 In other words, what was done was to take --  
20 construct a very simple model, which could be -- well,  
21 which used the fresh water flow as a driving force --

22 Q Right.

23 A The distribution resulting from that model was  
24 compared with data from the river. Those cases which showed  
25 a very significantly different distribution are not

7mil 1 believed to be good examples or good simulations, if you will.  
2 The predictions from those are not considered as valid a  
3 prediction as those which match the distribution much more  
4 closely. The 1968 data which is included in that table  
5 represent a condition of high flow.

6 Q Yes.

7 A And as a result a greater proportion of the  
8 population would be expected to migrate past the plant.

9 This is entirely consistent --

10 Q In an entrainable form?

11 A Yes. The data in that table really don't have  
12 much to do with the prediction itself, only with evaluating  
13 the prediction. The fact they do distribute in the way they  
14 do is in part validating the modeling which was used to  
15 construct the model, which essentially says that the flows  
16 are transporting the fish in a larval state.

17 Q Didn't you use Table 5-11, though, to determine --  
18 if you model produced a result that was similar to the data  
19 that are shown in Table 5-11, did you then conclude your  
20 model was showing accurate results?

21 A Not necessarily. As a matter of fact most of  
22 the predictions from the model have a significantly different  
23 distribution from that 1968 data, in that there is more upstream  
24 concentration of fish, a greater proportion of the fish are  
25 upstream from Indian Point than is predicted, if you look at

8mil

1 the table.

2 Q So in your model you are predicting significantly  
3 less than 70 to 90 percent of the --

4 A Significantly less than 90 percent.

5 Q Significantly less than 90 percent. Would it be  
6 significantly less than 70 percent?

7 A Well, below Indian Point it could be. It depends  
8 again on the exact flow circumstances you are modeling.  
9 However, if you include the Indian Point sector, 70 percent --  
10 I would expect that on most of the situations that were  
11 modeled, at least 70 percent, or very close to 70 percent,  
12 were at one time or another exposed to the plant.

13 Q Now with regard to what you have just said, let  
14 me ask you another clarifying question to be sure that I  
15 understand what you said. Is it implicit in your analysis  
16 that 30 to 50 percent of striped bass larvae which migrate  
17 past Indian Point will likely be killed, that almost all of  
18 the striped bass eggs and larvae move past Indian Point from  
19 upstream to Haverstraw Bay?

20 MR. LYLE: Excuse me, could we have those questions  
21 one at a time?

22 THE WITNESS: Would you please?

23 MR. TROSTEN: Would the reporter read the question  
24 back?

25 (The reporter read the pending question.)

9mil 1 CHAIRMAN JENSCH: There was an objection that it  
2 was a double question. Can you simplify it? I think first  
3 was the percentage and the second was all.

4 MR. TROSTEN: The 30 to 50 percent was the state-  
5 ment of his conclusion.

6 CHAIRMAN JENSCH: From what are you reading?  
7 Is it some part of the FES?

8 MR. TROSTEN: Yes.

9 CHAIRMAN JENSCH: I think it might be helpful to  
10 give us a reference if it is a predicate of the question.

11 MR. TROSTEN: I wasn't at that moment reading from  
12 the FES, but I will find the page. The page I was thinking  
13 about when I said that was page 548, the third full paragraph,  
14 first sentence. "The Staff analysis indicates that during  
15 June and July of most years 30 to 50 percent of the striped  
16 bass larvae which migrate past Indian Point from upstream  
17 spawning areas are likely to be killed by entrainment."

18 My question is, is it implicit in that Staff analy-  
19 sis that almost all of the striped bass eggs and larvae move  
20 past Indian Point from upstream to Haverstraw Bay?

21 THE WITNESS: No. The statement, as it reads there,  
22 says that 30 to 50 percent of the larvae which migrate past  
23 Indian Point from upstream may be killed.

24 BY MR. TROSTEN:

25 Q My question was what percentage are you assuming

10mil

1 of the eggs and larvae are migrating past Indian Point.  
2 I characterized it as almost all, but my question really is  
3 what percentage of the striped bass eggs and larvae are you  
4 assuming come down from north of Indian Point and proceed to  
5 Haverstraw Bay?

6 A Well, again that particular statement does not  
7 assume any particular fraction of the total population moving  
8 through the area. It is simply related to those that do.  
9 Now the answer to the question that you are getting at is  
10 not really --

11 Q Have you answered my question? Because maybe the  
12 next one I will pose -- Dr. Geyer, did you have something?

13 DR. GEYER: Go ahead.

14 CHAIRMAN JENSCH: I think he hadn't quite  
15 finished his answer. Proceed, witness.

16 THE WITNESS: Well, again that 30 to 50 percent  
17 quoted in that sentence you just read has no assumption with  
18 it concerning the proportion of the total population which  
19 migrates past Indian Point. In most years something like 70  
20 percent could be expected to either have migrated past Indian  
21 Point or be present in the Indian Point vicinity in an  
22 entrainable stage.

23 BY MR. TROSTEN:

24 Q Do you consider in an entrainable stage to be in  
25 June and July?

11mil 1

A Yes.

2 Q That is it?

3 A Well, and earlier.

4 Q Right. But from the time spawning begins until --

5 A Until sometime in July.

6 Q With respect to that conclusion that an entrainable  
7 stage runs through sometime in July, which is what you just  
8 said, and that a very substantial percentage would pass by  
9 Indian Point or be in the vicinity of Indian Point by that  
10 time, bearing that conclusion in mind -- have I stated it  
11 correctly?

12 A Well, with one reservation. Not all of the fish  
13 at the 1st of July, for instance, are still in an entrainable  
14 stage. Those which were spawned earlier are no longer within  
15 that age group which would be considered entrainable. So  
16 that you would really, there would be fish in an entrainable  
17 stage throughout most of July, but the proportion of the total  
18 annual production through that month, which is entrainable,  
19 would be declining. With that reservation in mind, what you  
20 said is okay.

21 Q Now with regard to that, what you said, let's  
22 look for a moment at Figure V-8, which appears on Page V-49.  
23 Does not the Figure V-8 -- let's look at the trawling  
24 data which is the only trawl data shown on that page. And the  
25 trawl data is the more quantitative data, data that can be

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1 used much more readily for quantitative purposes than sign  
2 data, would you agree with that?

3 A Yes.

4 Q That shows the peak in Haverstraw Bay in 1969  
5 occurred essentially at the beginning of July. Is that  
6 correct?

7 A Yes.

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1           Q     Now, does that indicate to you then that the  
2 majority of the eggs and larvae has passed by Indian Point  
3 prior to the first of July? In other words, if the peak of  
4 the larvae appears in Haverstraw Bay at the beginning  
5 of July, does that indicate to you that the peak amounts of  
6 juveniles must have passed by Indian Point sometime before the first  
7 of July?

8           A     No, not necessarily. I am sorry. Those points  
9 which are represented in that figure are monthly averages. And it  
10 is very difficult to say anything about what happened between  
11 two months. If you look -- well, the June figure was almost  
12 zero and in July it reached a peak. That peak really could  
13 have resulted from high catches, anytime in the month. I  
14 can't say one way or another about when it occurred.

15           However, I would like to point out one other facet.  
16 While this data was being gathered, the earlier the sampling,  
17 the higher will be the mortality rate. So, that the differences  
18 between two points on the graph for one sampling station  
19 could represent mortality as well as in-migration or out-migration  
20 -- well, as well as out-migration. And the fact that the drop  
21 that you see between July and August does not mean that the  
22 fish have stopped coming in.

23           They could still be migrating in. However, the samples  
24 would show a smaller number in the catch simply as a result  
25 of natural mortality between the two sampling periods.

1           Q     One thing that puzzles me about Figure 5-8 --  
2     I will refer to the third line on page 5-48, where you say the  
3     peak abundance of young-of-the-year striped bass below  
4     Indian Point generally occurs in late July and early August,  
5     and you refer first to 5-8 and 5-9.

6                 In looking at Figure 5-8, which is one of the two  
7     references that you cite for this statement, I see that the  
8     peak abundance in 1969 as shown by trawl data, which is the only  
9     trawl data shown on the page, occurs, at least according  
10    to the graph, at the beginning of July, and the peak abundance  
11    from the 1967 Haverstraw Bay seine data occurs at the  
12    beginning of July, and the peak abundance in the 1955 Grafton  
13    and Miller seine data occurs some time in the latter part of  
14    June.

15                 And the only data that show a peak in July or  
16    August really, the middle or latter part of July or August,  
17    are the 1968 and 1969 NYU seine data. So it seems to me as  
18    if Figure 5-8, Dr. Goodyear, tends to show the peak abundance  
19    occurs in Haverstraw Bay and Indian Point considerably earlier  
20    than you depict in your testimony, just by looking at your  
21    Figure 5-8.

22                 Are you following what I am saying?

23           A     Yes, if I could have a minute, I would like to  
24     check my notes.

25           Q     Yes.

1           MR. TROSTEN: Mr. Chairman, while Dr. Goodyear  
2 is conferring, I have spoken with Mr. Lyle, and what -- we  
3 have not finished our discussions yet -- but what I would like  
4 to do is to have an opportunity to pose some questions to  
5 Dr. Goodyear and then to meet with him perhaps this evening  
6 to try to shorten the period of time that would be involved  
7 in his being on the stand. I would like to do this in order  
8 to make sure that we understand all points, so we avoid the  
9 need for clarifying questions.

10           CHAIRMAN JENSCH: I think that would be rather  
11 helpful.

12           MR. TROSTEN: And also we make sure that the only  
13 questions we pose to him are the ones  
14 needed to straighten the record out.

15           CHAIRMAN JENSCH: I think that would move the case  
16 along.

17           MR. LYLE: Mr. Chairman, I have talked to some of  
18 my superiors at the AEC, and one of them would prefer to  
19 be at that meeting if possible. I am wondering if we could  
20 break early to schedule the meeting around five o'clock. Would  
21 that be acceptable?

22           CHAIRMAN JENSCH: Yes. Where is the meeting  
23 to be held?

24           MR. LYLE: We haven't set a place yet.

25           CHAIRMAN JENSCH: You might want to know whether you

1 want to leave here at 4:30 or something like that.

2 MR. TROSTEN: Yes, we will arrange that.

3 CHAIRMAN JENSCH: Very well.

4 BY MR. TROSTEN:

5 Q Have you considered the answer, Dr. Goodyear?

6 A Yes. The period -- as I pointed out a minute ago,  
7 the point on several of these plots are monthly means  
8 and you can't really infer anything about the portion of the month  
9 that they refer to, that the trend refers to. The exception  
10 to that is the 1955 data from Grafton and Miller. Now, the  
11 legend, the mark for July, for instance, is the mid-point  
12 of the month.

13 Q That was going to be the next question. Is that  
14 not July 1, but on your chart that is July 15? Is that what  
15 what the mark means?

16 A Yes.

17 MR. MACBETH: Could I have that exchange clear on  
18 the record. Did the witness indicate that some points on  
19 this graph do indicate July 15? As I understood him earlier,  
20 he said it was simply indicating July.

21 THE WITNESS: It is the mid-point of July. For  
22 the 1955 data, it would represent about July 15.

23 MR. BRIGGS: For the 1969 data, should that peak  
24 be moved over to the mid-point between July and August?

25 THE WITNESS: One could do that.

1                   MR. BRIGGS: Should one do it? I notice  
2 there is a mid-point plotted in June, and it is a question  
3 of whether you intended that the points be plotted in the  
4 middle of the month, or the beginning of the month, or whether  
5 that July indicates the middle of the month.

6                   DR. GEYER: The proper way to plot it as a horizontal  
7 bar covering the period for which the average applies.

8                   THE WITNESS: Let me have one more minute. Well,  
9 I thought I had the original drawings with me, but I don't  
10 appear to.

11                  BY MR. TROSTEN:

12                 Q. Would you like to make this the subject of -- would  
13 you care to supplement your response after you have had  
14 an opportunity to consult your notes? That would be fine.

15                 A. Well, I would like to consult my notes. However,  
16 the error is one of the plotting the information, and the June  
17 data point in the 1969 trawl data should have been at the June  
18 mark, the way this is plotted in the rest of the figure.

19                 Actually in most of the figures, they were not  
20 divided up this way. It makes it somewhat misleading. If you  
21 look at Figure 5-9, for instance, the legends are more clear.  
22 This was something that happened between my drawing the thing  
23 and it being drafted, and I never did catch it. There were  
24 several things I didn't catch.

25                 Q. The problem here is that I think the statement that

1 you have here on the second line, on page 5-48 is a very  
2 important one to the way in which your predictions occur.

3 In other words, the conclusion that you have drawn  
4 here is very important to your overall conclusion, I believe.  
5 I think this is indicated in SEction 12 of the report. I will  
6 read you the particular section. I want you to have the  
7 context of my question clearly in mind. On page 12-26 and  
8 12-27 you have the following statement: "The Applicant  
9 has apparently misjudged the key elements upon which the Staff  
10 Analysis is based. Two important considerations provide the  
11 framework for the Staff's analysis. That is, the life history  
12 of the striped bass and the magnitude of the mortality  
13 which may result from the operation of the plant, Appendix 5-3.  
14 The striped bass were determined to be susceptible to the  
15 intake for aperiod of somewhere between six and eight weeks  
16 during June and July."

17 That is a conclusion that I regarded as quite  
18 important, and which I regarded as being closely related to  
19 the statement that appears on page 5-48. You go on to say,  
20 "During this time; they occupy a zone in the estuary that extends  
21 from mile point ten to thirty, with greater abundance of  
22 larvae in areas of low salinity within the plant segment."

23 Now, you also say, back on page 5-48, "The Applicant  
24 suggests that the downstream migration is composed of older fish  
25 that are not susceptible to entrainment is not supported by the

1 available data."

2           Then you cite, you have this sentence again and you  
3 cite Figures 5-8 and 5-9. So we have this very critical  
4 point of your analysis, I think, Dr. Goodyear, about susceptibility  
5 of the entrainments of these larvae, based on this data. It  
6 seems to me Figure 5-8 does not support the conclusion you  
7 have drawn in that sentence there. If you could consult  
8 your notes and explain to me how you feel this figure properly  
9 drawn does support that sentence, I would appreciate it.

10          A       The sentence is really based on the data that was  
11 used in constructing the figure. It doesn't have anything  
12 really to do with the figure itself.

13          Q       But the only basis I have for knowing what you are  
14 thinking was the figure?

15          A       Right. The fact that -- well, the peak in every case  
16 was either in July or August and that is indicative of the  
17 fact that the organisms migrated or terminated their  
18 migration in July and August. The older fish that mature  
19 upstream or mature or actually grow to a larger size upstream,  
20 come down later in October.

21          Q       But the point you say here is that it occurs  
22 in late July and early August. And this period of time is  
23 very critical, because it has to do with the time that you  
24 run your model, it has to do with the amount of time in  
25 which your model predicts, as I understand your model -- and

1 Dr. Lawler can get into this more with you later -- that has  
2 to do with the amount of time your model predicts the larvae  
3 are going to be killed by entrainments.

4 A This information itself does not.

5 Q No, I realize that.

6 A The six to eight weeks does influence that.  
7 However, the data that were used to select the six to eight  
8 week period, this is not part of that data. That data is prin-  
9 cipally from growth data from several other studies, some of  
10 them not even on the Hudson. The growth data for the  
11 San Joaquin fish, Mansueti test material, and the information  
12 in the Carlson-McCann Report was used to come up with the  
13 six to eight week period. This information that is presented  
14 here does, in fact, or is, in fact, consistent with the informa-  
15 tion that was used to evaluate the duration of the susceptibility  
16 of the larvae.

17 Q In other words, what you are saying is in rebuttal to  
18 the Applicant suggestion, which is stated in the first sentence  
19 of page 5-48, you weren't offering this as rebuttal, but  
20 you were offering something else which you just mentioned that  
21 is not mentioned here?

22 A No, the fact that the downstream migration is not  
23 composed of older fish is because of the fact that the fish  
24 get down there by July and August.

25 Q Is this the reason why you think they get down there

1 by July and August?

2 A Yes.

3 Q You said by late July and early August. That is  
4 an important point.

5 A The contrasting opinion at the time --

6 MR. LYLE: Mr. Chairman, I think counsel for the  
7 Applicant is arguing with the witness. I just feel the  
8 witness should have more time to prepare his answers.

9 MR. TROSTEN: Excuse me. I don't mean to argue  
10 with him. I am just trying to understand him.

11 CHAIRMAN JENSCH: I didn't have the impression he  
12 is arguing at all. I think he is trying to clarify things.  
13 Proceed.

14 THE WITNESS: I think you should bear in mind when  
15 you read that discussion there about the Applicant's suggestion  
16 concerning downstream migration that the contrasting opinion  
17 was one of whether or not they were migrating in October  
18 or in an entrainable stage which would terminate in July  
19 and August.

20 In other words, the information that is presented  
21 here to show that the fish actually do migrate, not as older fish,  
22 but as fish, probably in the entrainable state, is related  
23 to a conflict between the conclusion that they migrate  
24 down to Haverstraw in October versus July.

1 BY MR. TROSTEN:

2 Q Could you tell me where the October date was stated?  
3 Is it in some presentation of Dr. Lawler or Dr. Raney, or  
4 anything that was offered to the Staff by way of testimony  
5 or evidence in this proceeding? I just want to understand  
6 what you are referring to.

7 A I would have to go back and look at all of the  
8 paraphernalia that was generated in the early parts of last  
9 year. I don't know off hand whether or not that particular  
10 statement was in the comments on the Draft Statement or not.  
11 I suspect that it was.

12 Q All right. When we talk further about this, let's  
13 consider this -- I would also like you to consider the testi-  
14 mony of the Applicant that is contained in the October 30  
15 testimony of Dr. Lawler, that is his model, and also Dr.  
16 Raney's testimony, and see if you consider that that is the  
17 Applicant's position. We don't have to discuss that now.

18 Turning to Figure V-9 -- I don't want to belabor this point,  
19 because I think you have already explained these figures are  
20 really not very representative, but let me tell you my problem  
21 with the figure, and when you have had a chance to consult your  
22 notes, we can determine if the data support the figure or  
23 are different from the figure.

24 Figure 5-9, you cite as support for your position  
25 that the peak abundance of young-of-the-year striped bass below

1 Indian Point generally occurs in late July and early August.

2 Now, when we discussed this back in the December  
3 hearings you made the observation that these bodies of water  
4 that are the subject of the Carlson-McCann studies do not have  
5 the same amounts of water in them. We were discussing  
6 the fact that the peak abundance in terms of average number  
7 of young-of-the-year seined up in these various seine haul  
8 collections actually were greater above Indian Point, that is  
9 at Kingston and Hyde Park, mile points 91 and 83, and Marlboro  
10 and Croton, that is mile points 69 and 56, and were the  
11 same at mile points 125 and 107, as they are at Peekskill and  
12 Croton which is mile points 42 and 35. And that figure  
13 would seem to indicate that the peak abundance -- that  
14 figure standing on its own would seem to imply that perhaps  
15 the peak abundance was above Indian Point in July and early  
16 August, rather than below Indian Point in July and early August  
17 as you stated in the second sentence on page 5-48.

18 Have you had an opportunity to consider whether  
19 that figure does indeed support your position? At the time  
20 we discussed this last, you said you would have to go  
21 back and look at the bodies of water and draw a conclusion  
22 about this?

23 A I have two things to say. First of all, the  
24 data for the various reaches of the river, the seine haul  
25 data can't be used quantitatively, only qualitatively.

#3

1 Q I agree. I was just trying to use it in the same  
2 way you were using it.

3 A No, you were not trying to use it in the same way,  
4 but the actual numerical abundance, the number per haul, has  
5 no relevance in comparing from one reach of the river to  
6 another. Only the position of the peak for that segment. In  
7 other words, what is being said here with this diagram is  
8 that there is no discrepancy or no large discrepancy on the  
9 seasonal occurrence of the peak in the various reaches of the  
10 river. It is not saying that most of them are downstream.  
11 As a matter of fact, the sentence says the peak abundance of  
12 young-of-the-year below Indian Point generally occurs in late  
13 July and early August, not that the peak in the river is below  
14 Indian Point in late July and early August. That is a different  
15 conclusion entirely.

16 Q Let me see if I understand these two sentences  
17 put together. "The Applicant's suggestion that the downstream  
18 migration is composed of older fish that are not susceptible  
19 to entrainment is not supported by the available data. The  
20 peak abundance of young-of-the-year striped bass below Indian  
21 Point generally occurs in late July and early August."

22 I understood that sentence to be addressing  
23 itself to the point raised in the preceding sentence, that is  
24 that the peak abundance was occurring below Indian Point at a  
25 particular time as opposed to above Indian Point at a particular

ar2

1 time of these young fish. That is what I understood the  
2 sentence to mean. So I thought it was perfectly all right to  
3 contrast the peak abundances above Indian Point and below  
4 Indian Point, in order to show that the peak abundance might  
5 well be above Indian Point in late July or early August, rather  
6 than below Indian Point as your sentence suggests. Do you  
7 understand the point I am making? Do you understand the  
8 problem I am having with your sentence?

9 A No, I don't.

10 DR. GEYER: The sentence does not say the peak  
11 abundance in the river occurs below Indian Point. It says  
12 that the peak abundance below Indian Point occurs in late July  
13 and early August.

14 MR. TROSTEN: That is right.

15 DR. GEYER: So he says nothing about when abundance  
16 upstream occurs.

17 THE WITNESS: The whole point of the analysis that  
18 is presented here is to indicate that the fish themselves,  
19 when they reach a size or age class, if you will, which  
20 changes their habits, so that they move into nursery areas,  
21 into shoal areas along the shoreline, that that in itself,  
22 or when they change to that behavioral pattern, they don't  
23 migrate downstream and go into Haverstraw Bay area.

24 The ones that are in Haverstraw Bay stay there,  
25 the ones that are upstream move into whatever habitat there is.

ar3

1 BY MR. TROSTEN:

2 Q Yes, right.

3 A And the whole point of the presentation, the analysis,  
4 that was presented here, is to show that the fish simply  
5 behave similarly at all positions in the river.

6 Q I think I understand what you are saying. Would  
7 you conclude, then, that Figure 5-9 could equally well support  
8 the statement that the peak abundance of young-of-the-year  
9 striped bass above Indian Point generally occurs in late July  
10 and early August? Does it support that statement as well?

11 A Yes.

12 Q Fine. Thank you.

13 Now, Dr. Goodyear, on page A-222, you say that  
14 after juvenile fish reach one inch in size, they are found in  
15 greatest abundance in Haverstraw Bay.

16 A What page was that again?

17 Q A-222. Now according to your growth chart which  
18 appears on A-569, the greatest abundance should not appear  
19 until sometime after July 14, isn't that correct? The two pages  
20 I am referring you to are page A-222 and A-569.

21 CHAIRMAN JENSCH: While he is looking at that, I  
22 wonder if you would tell me how you collected July 14?  
23 Doesn't the sharp increase occur June 16?

24 MR. TROSTEN: I was thinking that the greatest  
25 abundance -- well, no, what I was saying, Mr. Chairman, was

ar4

1 this, that there certainly is a larger abundance after July  
2 14 than as of June 16.

3 DR. GEYER: These are length, are they not?

4 MR. TROSTEN: Yes, those are length figures.

5 CHAIRMAN JENSCH: Not abundance?

6 MR. TROSTEN: They are not abundance figures. But  
7 the point is, Dr. Geyer, if you look at the one-inch length,  
8 plot that on the vertical axis, and it becomes sometime after  
9 July 14. That was the point of my question, that the greatest  
10 abundance would appear sometime after July 14. In other words,  
11 the fish are reaching the length of one inch sometime as of  
12 July 14, as I read the chart. And they are not reaching -- I  
13 just wanted Dr. Goodyear to confirm that, that they are  
14 reaching one inch sometime after July 14 or sometime there-  
15 after.

16 CHAIRMAN JENSCH: I wonder if we may have that  
17 first question and then consider it in light of this last  
18 question.

19 MR. TROSTEN: Sure.

20 BY MR. TROSTEN:

21 Q My first question about the -- well, there were  
22 two points I was making. One was a reference, I just wanted  
23 Dr. Goodyear to go back and for a frame of reference I wanted  
24 him to look at the statement he made on page A-222, that  
25 after the young bass reach a length of about one inch, they

ar5

1 are found in greatest abundance in Haverstraw Bay. That was  
2 not the question, just a point of reference. My first ques-  
3 tion was according to your growth chart on A-569, the  
4 greatest abundance should not appear in Haverstraw Bay until  
5 July 14 or thereafter. Do you agree with that?

6 A Not necessarily, no. I have a problem in under-  
7 standing really what you are getting at. The peak, the relation-  
8 ship between the size of the fish and the peak --

9 Q May I tell you what I am trying to get at? What  
10 I am trying to get at is I am trying to explore with you the  
11 possibility that the fish are growing earlier in the Hudson  
12 River than you think they are from the data that you have.

13 DR. GEYER: This curve you are referring to is a  
14 maximum. That could just be one fish that grew the fastest  
15 of all they looked at.

16 MR. TROSTEN: Well, I have a feeling that these --  
17 what do the mean and minimum mean, Dr. Goodyear? Those  
18 are plankton data, are they not, or am I wrong about that? This  
19 is a rather confusing graph, Dr. Geyer. I think I am right  
20 about that.

21 THE WITNESS: Right. The data that were used to  
22 derive this plot come from the comparison here that Carlson  
23 and McCann used in 1968. What they did was to take several  
24 different gear types and to determine when the fish, by  
25 using the different gear types, they determined when the fish

ar6

1 began to escape one gear, so that their efficiency in collect-  
2 ing the fish was dropping off. This enabled them to shift  
3 gear types to follow the growth of the fish.

4 Data presented here comes from the actual samples  
5 which used several gear types simultaneously. Now this  
6 allowed them to catch a wider variety of fish.

7 BY MR. TROSTEN:

8 Q Right. Is it not true that the minimum and mean  
9 curves represent plankton collections, with plankton gear?

10 A Well, the maximum does, too, until they switched to  
11 another type of gear.

12 Q I see.

13 A Now the mean and the minimum really can't be used  
14 much for interpretation, simply because they are heavily  
15 biased by new larvae. The maximum, on the other hand, repre-  
16 sents the upper limit of what they caught. In other words,  
17 it is the largest fish they caught during the sampling period.  
18 As a result you could use the maximum size grouping as an  
19 indication of the growth rate, whereas you could not use the  
20 mean or the minimum.

21 Q Just so I am sure, you are using this top curve  
22 here as an indication of the growth of striped bass in the  
23 river, is that correct?

24 A For that year, yes. If you will notice, too, since  
25 you are taking the maximum size class, you really are taking

ar7

1 a sample which represents the earliest spawned fish, because  
2 the earliest spawned fish should be the largest fish at any  
3 sampling period. If you look at the time period, it takes  
4 10 weeks to get to an inch in length.

5 Q Now you say it takes 10 weeks. In other words,  
6 you are assuming that this does represent the fish that are  
7 spawned, that this curve represents a growth rate for the  
8 fish that are spawned at this earliest date here?

9 MR. MACBETH: What do you mean by "this curve"?

10 MR. TROSTEN: The top curve on page A-569.

11 THE WITNESS: From a strictly logical standpoint,  
12 it would be, yes. You would have to have it in reference  
13 to the very first spawning. However, it is biased, because  
14 of the net downstream loss of the smaller, or the fish as  
15 they are spawned. So it would be biased from the fact that  
16 the earliest spawned fish would be represented to a less  
17 degree than later spawned fish.

18 BY MR. TROSTEN:

19 Q In other words, the later spawned fish are being  
20 represented in this curve, too, aren't they? The top curve  
21 on page A-569? Is that correct?

22 A That is impossible to say, because in order to  
23 determine whether or not later spawned fish were actually the  
24 fish that were collected, you would have to know when they  
25 were spawned. In other words, theoretically it should have

ar8

1      been the first spawned fish, but there is a sampling bias in  
2      it which may allow younger fish to get into the curve.

3            Q     Isn't it also true that they are simply sampling  
4      the fish that are in this size range, and as the fish that  
5      were spawned later enter this size range, they begin to  
6      contribute to that size range? Isn't that right? For example,  
7      a fish spawned here on the 1st of June could enter this size  
8      range and then begin to contribute to it as the trawling  
9      continued?

10            MR. MACBETH: By "this size range," you mean --

11            MR. TROSTEN: The size range in the top curve, the  
12      so-called maximum curve on page A-569.

13            THE WITNESS: I am having a little problem under-  
14      standing exactly what you mean by contributing to a size  
15      range.

16            BY MR. TROSTEN:

17            Q     Yes, a fish spawned on June 1 would begin to grow,  
18      it would reach a size at some point when it was being caught  
19      by this gear and it would begin to be represented in the  
20      catch that is represented by the maximum curve. Isn't that  
21      true?

22            A     Well, the maximum curve doesn't represent a catch.

23            Q     It represents the length of the fish that are  
24      being caught.

25            A     The maximum --

ar9

1 DR. GEYER: The longest fish that is being caught,  
2 just one longest fish.

3 BY MR. TROSTEN:

4 Q This is a collection of -- does that represent  
5 the one longest fish that is being caught?

6 A On that sampling period with that gear, yes -- not  
7 with just that gear, with all of the gear used, a combination  
8 of everything they used at that period.

9 Q All right.

10 MR. BRIGGS: I have just one question here. Is  
11 there an obvious reason why the size of the maximum fish  
12 doesn't change between, oh, say 5-12 and 6-9?

13 DR. GEYER: Those are dates.

14 MR. BRIGGS: Yes, those are dates.

15 THE WITNESS: Actually there is a good reason  
16 to expect it would not change simply because the growth rate  
17 is very slow as long as the larvae are feeding on micro-  
18 zooplankton. Once they begin to be large enough to take the  
19 benthic forms, such as gammarus, they start to grow much  
20 more rapidly. That is the reason for the shape of the curve  
21 itself.

22 MR. BRIGGS: So in that period of four weeks, they  
23 don't change much in size?

24 THE WITNESS: You would not expect them to grow very  
25 rapidly for several weeks. As a matter of fact, for the first

ar10

1 nine days or so they don't even feed. So that will give you  
2 some idea.

3 MR. BRIGGS: Thank you.

4 THE WITNESS: Also in the early part of the season  
5 the growth rate is lower because of the temperature effect.  
6 That also would contribute to a longer, or contribute to a  
7 bias in this set of data. It would essentially make the data  
8 be applicable only to the longest time period it would take  
9 them to grow to the size indicated in the maximum curve.

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10 BY MR. TROSTEN:

11 Q Dr. Goodyear, I just have one concluding question  
12 with regard to this graph. You have now mentioned all of  
13 the data sources on which you rely for your conclusion as to  
14 the growth rate of the striped bass in the Hudson. Is that  
15 correct? It is the data that are reflected in this graph,  
16 which are the Carlson and McCann data, and you gave a series  
17 of references a few moments ago that you relied upon for your  
18 conclusions as to the growth rate of striped bass. Is that  
19 true?

20 A I don't really remember all of the things I men-  
21 tioned.

22 Q We can go back and look at the transcript.

23 A There are several sources of data which were  
24 evaluated, all of them were consistent with the information  
25 that is presented in Figure A-515. I can't, off the top of

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1 my head, remember.

2 Q Now the data that are -- going back for a moment  
3 to Figure 5-8 and 5-9, the ones you were going to check,  
4 on pages 5-48 -- I am sorry, Mr. Chairman, that I keep flipping  
5 back and forth between the appendix and the body, but the two  
6 discussions are intimately mixed.  
7

7 The data that you refer to on page 5-48 -- I am  
8 sorry, in Figures 5-8 and 5-9, those data were not collected  
9 for the specific purpose of estimating comparative populations  
10 of young striped bass above and below Indian Point, were  
11 they?  
12

A You mean the comparative abundance above and below  
13 Indian Point?  
14

Q That is right.  
15

A These are only presented for temporal distribu-  
16 tion.  
17

Q For temporal distribution.  
18

Are you aware of any data collection effort to date  
19 that has been aimed at the specific purpose of showing  
comparative numerical populations above and below Indian Point?  
20 And I am speaking specifically now of the period in their  
21 life cycle when they are of entrainable size.  
22

A Would you repeat that?  
23

24 (The reporter read the pending question.)  
25

THE WITNESS: No.

ar12

1 BY MR. TROSTEN:

2 Q Now turning back again to page 5-48, what size are  
3 the young striped bass which you believe appear in late July  
4 and early August near Indian Point and in the Haverstraw Bay  
5 area? I am referring you, for your conclusion here, as a  
6 point of departure, to the statement that appears on page  
7 5-48, second sentence. "The peak abundance of young-of-the-  
8 year striped bass below Indian Point generally occurs in  
9 late July and early August."

10 You were speaking here merely of temporal distribu-  
11 tion. I wanted to know what size you thought those young  
12 striped bass were?

13 A I would have to check my notes to be absolutely  
14 sure, but as I remember, the length would be somewhere in the  
15 range of an inch to an inch and a half.

16 Q What are the data sources that you are relying  
17 upon again? Are they the same data sources you rely upon  
18 for your general conclusions as to the growth of the striped  
19 bass in the Hudson River?

20 A Well, the data that was specific to the Hudson  
21 River, yes.

22 Q So this was all Hudson River data you were relying  
23 on?

24 A Not for growth rate, it was not. But for the  
25 size, the last question you asked, the size of the fish in

ar13

1 Haverstraw at the peak, it is data that was specific for  
2 the Hudson River. I believe some of the best data actually  
3 is in the Bowline report.

4 Q Turning to page 5-54 --

5 CHAIRMAN JENSCH: I wonder if this is a feasible  
6 procedure? Many times the witness has been asked, not only  
7 this witness, but others have been asked are these the data  
8 on which you rely, and from his recollection he gives an  
9 enumeration. I wonder if the interim after tomorrow, if any  
10 witness, whether Applicant or Staff witnesses, think of data  
11 that could be additional to the support, that they should  
12 have the opportunity of telling their attorneys, and they  
13 will correspond with all parties about it. Because I think  
14 you might get a limitation of reliance that might not be  
15 really helpful. If the witness thinks of some other support,  
16 he should feel free to tell his attorney and let it be  
17 communicated.

18 MR. TROSTEN: I think that would be very helpful,  
19 yes.

20 CHAIRMAN JENSCH: Proceed.

21 BY MR. TROSTEN:

22 Q Turning to page 5-54, you say that the principal  
23 assumption which could reduce your estimate of recruitment  
24 loss -- this is the first sentence in the first full para-  
25 graph on page 54 -- you say the principal assumption which

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1 could reduce your estimate of recruitment loss is that  
2 mortality is independent of the density of the species.

3 Now may I suggest some other hypothesis which  
4 might reduce your estimate of recruitment loss, and see if  
5 you agree that these hypotheses, if they were shown to be  
6 valid, would reduce your estimate of recruitment loss. May  
7 I do that with you?

8 A Certainly.

9 Q Supposing that it were shown that a very large  
10 percentage of the fish or a substantial percentage of the fish  
11 which appeared in the vicinity of Indian Point were, relative  
12 to all of the fish in the Hudson River, a substantial percentage  
13 relative to all of the fish in the Hudson River, were large  
14 enough to have behavioral characteristics which would cause  
15 them to avoid the areas of the intake.

16 If this hypothesis were shown to be valid, would  
17 this reduce your estimate of recruitment loss?

18 CHAIRMAN JENSCH: I wonder if I could understand  
19 the question. Is your question that if there are a large crowd  
20 of fish in Indian Point that will keep away from the intake,  
21 wouldn't you have less impingement or entrainment? Is that  
22 the question?

23 MR. TROSTEN: If a large percentage of the fish  
24 in the Hudson River --

25 CHAIRMAN JENSCH: Just would keep away from that

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1 intake?

2 MR. TROSTEN: Yes. The reason why they do it --  
3 may I go to the blackboard for a moment, Mr. Chairman?

4 CHAIRMAN JENSCH: Sure. There just wouldn't be  
5 any entrainment or impingement.

6 MR. TROSTEN: I think Dr. Goodyear testified  
7 earlier today that -- I apologize as a lawyer for trying to  
8 explain this, but let me do the best I can.

9 CHAIRMAN JENSCH: I certainly won't criticize it  
10 as another lawyer.

11 MR. TROSTEN: If you have, just to take the  
12 Indian Point area as a profile (drawing on board) or as an  
13 example, when the fish reach a certain size, and what size this  
14 is is a matter of some dispute, but when they reach a certain  
15 size, their behavioral characteristic is such that they tend  
16 to go into the shallow areas, they tend to become bottom-  
17 dwelling and go into the shallow areas.

18 Dr. Goodyear has testified to this and other  
19 witnesses, as well. If that were true, they would avoid the  
20 areas of the intake, this area which is located on this very  
21 steep part of the Hudson River, because of a behavioral  
22 characteristic that would cause them to do that. This is  
23 talking about the entrainment phenomena, Mr. Chairman, not  
24 about the impingement.

25 Well, it is actually talking about both, because

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1 if they were to go to the sahllow areas, they would not be  
2 there to be entrained or impinged. It is that phenomenon  
3 I am discussing here.

4 CHAIRMAN JENSCH: Very well. Proceed. Does  
5 the witness understand the question? Can you give us an  
6 answer?

7 THE WITNESS: I understand the phenomenon he is  
8 speaking about, but I don't understand exactly what the ques-  
9 tion was saying.

10 BY MR. TROSTEN:

11 Q My question was if a substantial percentage of the  
12 fish which appeared in the vicinity of Indian Point were of  
13 such a size that their behavioral characteristics caused  
14 them to avoid the areas of the intake, would this reduce  
15 your estimate of entrainment loss? Your estimate of entrain-  
16 ment loss.

17 Can I try to explain the context in which I am  
18 asking the question? You have an estimate on one of the pages  
19 here that 30 to 50 percent of the surviving portion of --  
20 "The Staff analysis indicates that during June and July of  
21 most years from 30 to 50 percent of the striped bass larvae  
22 which migrate past Indian Point from upstream spawning areas  
23 are likely to be killed by entrainment." It is in the context  
24 of that estimate that I am asking you the question. Do you  
25 understand the question now?

1           A     I believe I do. I have to respond it would not  
2 change the estimate. The reason for that is that behavioral  
3 characteristics which tend to make them move into the  
4 shoal areas also tend to make them less migratory in the  
5 river. This is precisely what the information that we went  
6 over a minute ago was designed to evaluate. So that for  
7 those which passed the plant, which migrate past the plant,  
8 the entrainment estimate would be the same, simply because the  
9 ones which are on the shoal areas are not migratory to the  
10 same extent.

11          Q     All right. I understand what you are saying. Now  
12 let me change the context of my question.

13                 Supposing it was shown that a very substantial  
14 percentage -- strike that. I will go on to a different ques-  
15 tion.

16          CHAIRMAN JENSCH: If you are going to go to a  
17 different subject, is this a convenient place to recess?

18          MR. TROSTEN: Yes, sir.

19          CHAIRMAN JENSCH: At this time let us recess, to  
20 reconvene in this room at 10:35.

21                 (Recess.)

22                 e4

23

24

25

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1 CHAIRMAN JENSCH: Please come to order.

2 Dr. Goodyear has resumed the stand. Are you  
3 ready to proceed, Applicant's counsel?

4 MR. TROSTEN: Yes, I am.

5 BY MR. TROSTEN:

6 Q Dr. Goodyear, turning to page A-222, you describe  
7 the details of spawning in the second paragraph there, and  
8 you cite a series of references. And you conclude from this  
9 that, in the third sentence in the second full paragraph,  
10 "The species spawns from Kingston to Bear Mountain, with the  
11 greatest concentration of eggs in the vicinity of West Point,  
12 although the exact location varies from year to year."

13 Now, the spawning distribution is one of the critical  
14 aspects of your model, is that right, spawning and flow? Is that  
15 correct? I thought you said that yesterday.

16 A It is not a critical aspect of the model.

17 The spawning distribution is fed in as data. But a change in  
18 the spawning distribution does not change the estimate  
19 a great deal.

20 Q It would not change the estimate?

21 A Not a great deal.

22 Q In the sense that you would still say 30 to 50  
23 percent of those that migrate would be entrained. Is that  
24 what you mean, in that sense it doesn't change it?

25 A That is not exactly correct, no. The total

1 population draw down which could be caused by the plant is  
2 not, from the model standpoint, is not too strongly dependent  
3 on the distribution of spawning within the estuary.

4 Q Let me ask you this question. Supposing that --  
5 just to take your last conclusion, to make sure I understand  
6 it -- supposing that the vast majority of spawning occurred  
7 in a particular year in the vicinities of Poughkeepsie to  
8 Kingston. This would influence, in fact, that the vast  
9 bulk of the spawning occurred in the vicinity of Poughkeepsie  
10 to Kingston in a particular year, this would influence the  
11 time, would it not, at which the young bass would reach a length  
12 at which they would tend to go to the shoals in the river.  
13 Isn't that correct?

14 A If they spawned at Poughkeepsie, it would influence  
15 the time they become shoal oriented?

16 Q That is right. In other words, if they were all  
17 higher up --

18 A I don't follow you.

19 Q Well, if they were all -- this being Haverstraw  
20 here.

21 (Drawing on board.)

22 And if the spawning was occurring in the upper  
23 reach, the vast bulk of it was occurring -- this being the  
24 Indian Point PLant -- the vast bulk of the spawning  
25 were occurring in this area up here, heavily concentrated up

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1 there, then would the fact that they were located up there,  
2 the vast bulk of the fish at the time of spawning were  
3 located up there, would that not influence the time at which,  
4 as they were beginning to drift downstream, they would reach  
5 a size where they would tend to become shoal oriented?

6 A It shouldn't. The only way you would be able to  
7 exhibit an influence of that nature would be to change the  
8 growth rate. The growth rate up there would either be higher  
9 or lower than the mean for the entire river.

10 Q It might change the growth rate, might it not,  
11 because of the temperature of the water up there relative  
12 to farther down. Is that what you mean?

13 A Either a temperature effect or it would be  
14 principally a food effect.

15 Q So it might change the growth rate, that is one  
16 way it might do it. But might it not also change the time  
17 at which they become shoal oriented in another way, in the  
18 sense that as the river flow tends to cause them to drift  
19 downstream, assuming that that is occurring, they being  
20 farther upstream, it would take them a longer period of  
21 time to drift down in this general direction, and during  
22 that period of time they would be growing. So when they did  
23 reach a size where their behavioral characteristics caused them  
24 to tend to be shoal oriented, they would tend to be in the more  
25 northerly stretch of the river than they would be if they had

1 been spawned in a more southerly stretch of the river?

2 A I am still not sure I follow the logic of the  
3 time relationship. It would affect their distribution in the river  
4 at the time that the fish had developed to a point that they  
5 became shore oriented.

6 Q That is exactly my point?

7 A But it wouldn't necessarily affect the time  
8 at which that occurred.

9 Q But it would affect the stage in the river at which  
10 they would become shoal oriented and that would tend to be  
11 a more northerly point, is that right?

12 A Yes.

13 Q That is exactly the point I wanted to ask you about.  
14 Now, if that were to occur, if the effect of this was that  
15 they become more shoal oriented at a more northerly point  
16 in the river, then there would be far fewer of them that would  
17 be subject to entrainment at Indian Point. Is that not true?  
18 A far fewer percentage of them that would be subject to entrain-  
19 ment at Indian Point, because of their shoal orientation?

20 A That is true. There is one point that ought to be  
21 raised in this regard though. The actual exposure under the  
22 circumstances that you are describing would depend upon the  
23 flow of the river, rather than the spawning distribution itself.

24 Q The flow in the river would be an important  
25 consideration too, wouldn't it?

1           A     Well, in a situation where most of the spawning  
2 was very, very far up the river, it would be tremendously  
3 important, much more so than the spawning itself.

4           Q     All right. Now, I would like to turn to another  
5 subject, Dr. Goodyear. I would like to try to conclude the  
6 examination with regard to the contribution of the Hudson to  
7 the middle Atlantic. What I think I ought to do, I will ask  
8 my associate attorney, Miss Davis -- I would like to introduce  
9 to the Board Miss Davis, Con Edison's law partner, Mr. Chairman.  
10 I will ask her if she would find the place in the transcript  
11 where we had these two questions we wanted to raise, so  
12 we can get this straightened out. While we are looking  
13 into that, I would like to ask you a few questions that again  
14 relate to the subject of the contribution of the Hudson  
15 to the middle Atlantic.

16           Do you have a copy of the transcript pages that  
17 contain pages 8561 to 8562? Could your counsel provide  
18 you with that. It is the transcript for January 15.

19           A     We will have to check.

20           Q     This is a related question -- you do have those  
21 pages now? Yes. All right. I want to ask you a question  
22 which is related closely to the questions we were discussing  
23 yesterday, but it wasn't exactly stated this way. On the  
24 bottom of page 8561, Mr. Clark made the following statement,  
25 beginning on line 23. "The AEC Staff has reported calculations

1 in the Final Environmental Statement for Indian Point No. 2,  
2 page Roman 12-36 and 38, from which it might be estimated  
3 that up to 79 to 93 percent of the mid-Atlantic stock of striped  
4 bass -- those caught from New York to Delaware -- may be of  
5 Hudson origin."

6 Now, this was in the excerpt you were reading last  
7 night, is that correct?

8 A Yes.

9 Q By way of background, I want to remind you,  
10 and you are aware, I am sure, that the pages that Mr. Clark  
11 was referring to there and the references that he was  
12 referring to there, when he used the number 79 to 93 percent,  
13 is the paragraph beginning on the bottom of page 12-36 and con-  
14 tinuing on to the top of page 12-38. I want to read that  
15 paragraph to make sure we are all talking about the same thing.  
16 It says, "Regression analysis of these data show that 93 percent  
17 of the variation in the three-year mean of the Atlantic  
18 landings during the period from 1930 to 1966 can be  
19 accounted for by variations in the three-year average."

20 And then he goes on, and there is one analysis  
21 showing an R squared of 93, and another R squared on page 12-38 of  
22 .79.

23 Now, Dr. Goodyear, do you agree with Mr. Clark's  
24 statement that appears in the quotation I read to you?

25 CHAIRMAN JENSCH: Does he have the portion in mind

1 also on 8562? I have a note here that there was some addition  
2 made by Dr. Clark of his --

3 THE WITNESS: Yes, I have that.

4 DR. GEYER: You have the correction?

5 THE WITNESS: Yes.

6 MR. TROSTEN: What are you referring to, Dr.  
7 Geyer.

8 DR. GEYER: There was a correction inserted on 8562,  
9 line 5.

10 MR. TROSTEN: Yes, thank you.

11 DR. GEYER: We just wondered if the witness had that.

12 THE WITNESS: Yes, I have it. The way the statement  
13 is written I can't disagree with it entirely. It looks very much  
14 like the R square values from the regression analysis  
15 were taken somewhat out of context. But one could compute --

16 MR. TROSTEN: Excuse me. Mr. Chairman, this is  
17 sort of a complicated subject; would you mind asking Dr.  
18 Goodyear if he could state yes or no and then explain his  
19 answer? I think it would be helpful to the record if he  
20 could do that.

21 CHAIRMAN JENSCH: Yes, I think sometimes he is having  
22 difficulty with maybe the premise of some of these questions  
23 and the reason I haven't suggested this heretofore is I have  
24 had the impression that in view of the difficulty with some  
25 of the premises, he has to start out with a moderation of it and

1 his first words would be I really can't answer yes or no  
2 and so forth. To the extent, however, that you can say yes or  
3 no, please do so and then you may explain it in any way you  
4 desire. But if you can't do that, you should feel free to say  
5 you can't answer yes or no because of certain reasons.

6 BY MR. TROSTEN:

7 Q Now, you have the question clearly in mind? I  
8 am referring to the statement that appears starting  
9 on line 23 and ending in the second word of line 3 on page  
10 8562. It starts on line 23 of 8561.

11 A Yes. Would you repeat the question for me.

12 Q Do you agree with that statement?

13 A Yes. As it is written. From the information that  
14 is reported, one could make estimates within the range that  
15 he is presenting. As I said a moment ago, it looks very much  
16 like he took the R square values that were presented out of  
17 context because the 79 and 93 percent figures look very much  
18 like the R square values, but one could come up with estimates  
19 for the mid-Atlantic stock which would be in that range.

20 Q But I am not, just to be absolutely clear, I  
21 am not asking you whether you could come up with estimates  
22 that are in this range, Dr. Goodyear. I am asking you  
23 whether the statement -- I am asking you whether you agree  
24 with that statement that appears there, not whether the estimated  
25 numbers that appear there as to the contribution of the Hudson

1 River striped bass population are in that range. I am asking  
2 you if you agree with that statement. Do you understand the  
3 distinction between the two?

4 A That was the distinction I was making when I said  
5 yes. I have to agree with the statement because one could  
6 estimate those figures from the computations --

7 Q From that computation, the one you report on page  
8 12-36 and 12-38, the two R squared values?

9 A Not from the R squared values, but from the  
10 regression line itself.

11 CHAIRMAN JENSCH: I think he should have a full  
12 opportunity to explain it, and if he has any qualifications  
13 to give to his having said yes, he may explain why it is a  
14 qualified yes, whatever explanation he desires to give. I  
15 think he should have a full opportunity to do that.

16 MR. TROSTEN: Yes. Miss Reporter, could you go  
17 back just before the Chairman's statement, could you read  
18 my statement and Dr. Goodyear's statement so we have the  
19 context clearly in mind?

20 (The reporter read the record as requested.)

21 BY MR. TROSTEN:

22 Q Are you saying that the R squared values  
23 are not a measure of the Hudson River contribution?

24 A Not in themselves they are not.

25 Q Dr. Goodyear, we may get back to this a little later.

1 but I just want to take that particular answer and digest  
2 that. May we go off the record a moment.

3 CHAIRMAN JENSCH: Yes.

4 (Discussion off the record.)

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1 CHAIRMAN JENSCH: On the record.

2 BY MR. TROSTEN:

3 Q On page 9111 of the transcript, Dr. Goodyear, I  
4 asked you a question, and this was the question you were  
5 considering when you looked at the transcript over the evening  
6 recess.

7 "Question: Does the size of the sports catch  
8 annually as estimated by Mr. Clark, relative to the size of  
9 the commercial catch in the middle Atlantic area, as estimated  
10 by you, cast any serious doubt on the validity of the  
11 regression analysis which you used in the Final Environmental  
12 Statement, in your opinion?"

13 A No.

14 Q In considering that question, Dr. Goodyear, if  
15 there were a sports catch of the size estimated by Mr. Clark,  
16 which was the subject of my question to you -- let me get out  
17 the map again and refresh our recollection on the numbers we  
18 were discussing yesterday -- Mr. Clark estimated approximately  
19 6 million Hudson River spawned fish in the fishery running  
20 from the Delaware-Maryland line to the Rhode Island-  
21 Connecticut line. Do you consider that estimate to be a  
22 reasonable estimate?

23 A Are you speaking of the standing crop or the  
24 yearly --

25 Q The yearly sports catch. That is what Mr. Clark

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1 was referring to, the yearly sports catch.

2 A The data that I have examined would not support  
3 that number.

4 Q They would not. Is that because you have not  
5 examined the sports catch statistics that were utilized by  
6 Mr. Clark in drawing his conclusions, or is there some other  
7 reason?

8 A Actually both of the statements are correct.

9 Q Would you explain, please?

10 A One way in which you can determine the size of  
11 the sport fish catch is through tag returns. When fish are  
12 tagged in the tagging program and released, they are  
13 essentially distributed -- well, they are susceptible to  
14 both the sport and commercial fishery. Now the proportion  
15 returned from the two different fisheries gives an indication  
16 of the relative proportion of the total fishing catch that  
17 the two fisheries -- the best way to do this is to say that  
18 most of the tag returns show about a 50-50 ratio between the  
19 commercial fishery and the sport fishery in returns. In  
20 some cases, it is as high as 60 percent to the sport fishery  
21 and 40 percent for the commercial fishery. There are several  
22 sources of bias in that data. But each one of the sampling  
23 surveys that I have examined show about the same type of relation-  
24 ship. This allows you to estimate the size of the sport catch  
25 from the tag returns, if you know the commercial catch. So

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1       that I think his figures are a little bit high. I am not  
2       sure how much. You could legitimately get probably three  
3       times the number of fish, three times the commercial catch,  
4       as a total number that are taken, when you include the sport  
5       fishery and include some of the bias.

6           Q       Is that the equivalent of saying that your estimate  
7       of Hudson River spawned fish caught annually by commercial  
8       fishermen, is 500,000 to 1 million --

9           A       Right.

10          Q       So you are saying that you would estimate that  
11       1,500,000 to 3 million Hudson River spawned striped bass are  
12       caught annually by sports fishermen, based upon tag returns  
13       that you have analyzed?

14          A       Yes, with one reservation. The area on the inside  
15       of Long Island Sound does not have a commercial fishery of any  
16       great extent, and it happens to be that area and the area  
17       around the mouth of the river that are not sampled very well  
18       by tagging data, because many of the fish are being caught  
19       before they get out into the region where the tagging studies  
20       have been performed. So there is another degree, I don't  
21       know how to say this, there is another portion of the total  
22       catch that is not accounted for by the tag returns at that  
23       point. I don't know how much it is, but it could be --

24          Q       By the commercial tagging?

25          A       By the ratio of commercial fishing to sport

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1 fishing. The sport fishing in that area seems to be very,  
2 very heavy. I am not certain at all what the size of the  
3 catch is at that point. It is reducing the number of fish  
4 that get into the areas where the tagging studies are going on,  
5 and where the commercial and sports fishing are competitive.

6 MR. BRIGGS: I misunderstood one of your answers,  
7 I believe.

8 Dr. Goodyear, did I understand you to say that the  
9 total sport catch plus the commercial catch was or could be  
10 three times the commercial catch, or that the sport catch  
11 could be three times the commercial catch?

12 THE WITNESS: The sport catch plus the commercial  
13 catch could be three times.

14 MR. BRIGGS: That was different from your question.

15 MR. TROSTEN: Yes, that was. I understood it the  
16 other way.

17 BY MR. TROSTEN:

18 Q In other words, you would say the total sports and  
19 commercial catch might be 1,500,000 to 3 million fish? Is  
20 that a correct statement?

21 A Yes. I must have misunderstood your question  
22 earlier.

23 CHAIRMAN JENSCH: With the same reservation, that  
24 in part of Long Island Sound there is extensive sport  
25 fishing, but you don't have any tagging results that would

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1 confirm the amount or indicate the amount?

2 THE WITNESS: Yes. There is no tagging returns  
3 and there is no real data on the size of the population  
4 from the commercial catch in that area.

5 CHAIRMAN JENSCH: Thank you.

6 BY MR. TROSTEN:

7 Q Now if there is a sports catch, if Mr. Clark were  
8 right, that there were 6 million Hudson River spawned striped  
9 bass being caught annually by sports fishermen in the area  
10 from the Delaware-Maryland line to the Rhode Island-Connecticut  
11 line, this would mean, then, that 6 million, anywhere from  
12 6,500,000 fish to 7 million fish were being caught annually  
13 by commercial and sports fishermen, Hudson River spawned  
14 striped bass, in the middle Atlantic.

15 Now accepting that hypothesis for a moment, what  
16 percentage of the total population -- I am sorry. Would  
17 the percentage of the total population that was being caught  
18 by the commercial fishery go down very significantly? Do  
19 you see my point?

20 A No.

21 Q You see, you have an estimate of 500,000 to 1  
22 million fish being caught annually by commercial fishermen.  
23 I said if you were to accept the theory that in addition  
24 to that, there were 6 million striped bass being caught annually  
25 by the sports fishery in this area, isn't it true that the

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1 percentage of the total population that is being caught by  
2 the commercial fishery would go down very substantially?

3 A It would be smaller.

4 Q Smaller by the simple comparison of these numbers?

5 A Smaller than what?

6 Q Well, let me explain the point I am getting at.  
7 You mentioned yesterday that the really important thing to  
8 bear in mind in terms of the concept of the commercial fishery,  
9 predation by the commercial fishery controlling the striped  
10 bass fishery, was the number of fish that were being taken  
11 by the commercial fishery and the number of fish that were  
12 getting away, that were not being taken by the commercial  
13 fishery. Do you remember that discussion yesterday? It was  
14 the ratio of these two things that was the important thing  
15 in determining the control that the commercial fishery was  
16 exercising over the striped bass population. Do you recall  
17 that discussion?

18 A I recall the discussion, but I am not certain  
19 that that is exactly what I said. The number of fish that  
20 get away, that escape the fishery, not just the commercial  
21 fishery, but the fishery in its entirety, and actually reach  
22 maturity, are the ones which have the feedback in terms of  
23 reproduction. So the controlling features -- well, they are  
24 really related to the escapement from the fishery, rather  
25 than from the ratio of the number caught to the number that

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1 get away.

2 Q All right. Thank you.

3 CHAIRMAN JENSCH: While there is a pause, I wonder  
4 if someone could help me. What was the basis for Mr.  
5 Clark's statement of 6 million? Was it an estimate or did  
6 it purport to be the total of the commercial fishing plus  
7 the tagged returns?

8 MR. TROSTEN: What it purported to be, Mr. Chairman,  
9 this estimate, the 6 million we have been talking about, had  
10 nothing to do with the commercial fishery. It was strictly  
11 an estimate based upon statistics gathered by the National  
12 Marine Fisheries Service in connection with the 1965 and 1970,  
13 I believe, salt water angling survey.

14 CHAIRMAN JENSCH: Did the National Marine Fisheries  
15 Service come up with this figure of 6 million?

16 MR. TROSTEN: No, sir. They came up with no such  
17 figure. They came up with an estimated number of fish caught  
18 in the north Atlantic region and the middle Atlantic region.  
19 And Mr. Clark, by a line of reasoning which is explained  
20 in his testimony, first concluded that 7.6 million fish  
21 were Hudson-influenced in this zone he defined, which is  
22 not the zones defined by the National Marine Fisheries  
23 Service. And by a further process of reasoning, relying  
24 upon the Staff's analysis and also upon his own tagging  
25 returns, he concluded that roughly 80 percent of the 7.6

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1 million were spawned in the Hudson River.

2 CHAIRMAN JENSCH: Thank you.

3 MR. MACBETH: I think it should be added also  
4 that he indicated that he had some serious doubts about the  
5 validity of the sports catch numbers, in that they would  
6 probably be high. There was a further discussion of that  
7 later in the transcript. There was an indication of it in  
8 his original statement. I think that should be borne in  
9 mind, that he did not feel that they were numbers likely to be  
10 low, but rather likely to be high.

11 DR. GEYER: As I understand it, these figures were  
12 gathered by making some sort of a Gallup poll of fishermen,  
13 asking them how many fish they caught last year. Is that cor-  
14 rect?

15 MR. MACBETH: More or less. It is done through  
16 the Department of Labor, when they collect statistics, at a  
17 set point of every five years they ask people they interview  
18 about elements whether or not they fished last year and  
19 then develop from the yes answers figures as to how many  
20 pounds they caught, what type of fish, and these very broad  
21 regions in which they catch them, the north Atlantic, running  
22 from the Canadian-American border to New York Harbor; and  
23 the middle Atlantic, running from New York Harbor to Cape  
24 Hatteras in North Carolina. And they are very broad categories;  
25 remember that discussion of the fact that they could not,

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1 the Department of Labor would not allow them to see figures  
2 more carefully broken down, because there were statistical  
3 problems involved.

4 For that reason, Mr. Clark then made an estimate,  
5 which he frankly called a guesstimate, I think, a couple of  
6 times, in which he allotted the total number of poundage of  
7 fish caught to what he considered the Hudson-influenced area,  
8 which was the commercial mid-Atlantic region, plus Connecticut.

9 CHAIRMAN JENSCH: I suppose if it is a total  
10 recall type of inquiry after the fishing season, it would  
11 probably be affected also by the time of the year, and during  
12 the Super Bowl game it might be a different figure than --

13 MR. MACBETH: One of the fundamental problems  
14 seems to be what he called prestige bias errors. Fishermen  
15 like to tell the census taker that they caught larger or more  
16 fish than is the fact. There seems to be a certain problem  
17 in trying to estimate how much fisherman brag.

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1mil 1 CHAIRMAN JENSCH: I take it Dr. Goodyear hasn't  
2 had quite that experience with the fishermen and his figures  
3 may be somewhat less accounted for in some way in that regard.  
4 I don't know. Will you proceed?

5 MR. TROSTEN: Yes. In this connection, Mr.  
6 Macbeth, is there going to be any revision of the Hudson River  
7 Fishermen's Association estimate of the value of the Hudson  
8 River striped bass fishery. We never got to that.

9 MR. MACBETH: There may be. I don't think I have  
10 to do that at this time. But there may well be.

11 CHAIRMAN JENSCH: Just one further thing. I take  
12 it that both Mr. Clark and Dr. Goodyear are using the same  
13 80 percent range figure out of whatever total either may  
14 consider to be in these areas of the Atlantic as having been  
15 spawned in the Hudson. Is that a correct statement? They  
16 both are using a general 80 percent figure of whatever is the  
17 total.

18 MR. TROSTEN: It now appears that both of them  
19 have derived an 80 percent figure, that is correct.

20 MR. MACBETH: I thought there was some indication  
21 from Dr. Goodyear yesterday that he might be higher than 80  
22 percent.

23 CHAIRMAN JENSCH: Yes, I recall something like  
24 that.

25 MR. MACBETH: Mr. Clark's figure was 80 percent.

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1 CHAIRMAN RICHARDSON: Thank you. Will you proceed,  
2 please.

3 BY MR. TROSTEN:

4 Q Now, Dr. Goodyear, would you say that meristic studies  
5 very clearly demonstrated whether the striped bass which  
6 reside in the lower part of the Hudson River south of  
7 Haverstraw Bay during the winter are of southern origin,  
8 such as the James River or the Chesapeake Bay? Do you want  
9 the question read?

10 A No, I understand the question.

11 CHAIRMAN JENSCH: While there is a pause, I wonder  
12 if you would explain the difference in the meristic  
13 studies and the tagging returns.

14 MR. TROSTEN: Yes, Mr. Chairman. The meristic  
15 studies are taxonomical studies are made to determine the  
16 racial characteristics of the striped bass by the characteriza-  
17 tion of the fins or other parts of the body. I understand  
18 that the ichthyologists have a way of doing this, they can  
19 look at the various striped bass which they catch and they can  
20 analyze certain characteristics of them and they can make  
21 a determination as to whether the striped bass come from a  
22 particular race that inhabits a particular river or from  
23 differences. Now there is testimony to this effect in Dr.  
24 Raney's paper which I can find for you, if you wish. And  
25 there has been other testimony in the proceeding on it.

1 mil  
2 CHAIRMAN JENSCH: It is wholly unrelated to any  
3 tagging operation? It is just whatever is caught, they make  
4 this examination.

5 MR. TROSTEN: I don't think it is related to the  
6 tagging operations, Mr. Chairman. Maybe it is, but I don't  
7 see why it would be. I think it is just a matter of trying  
8 to -- well, I can see some relationship to it. But I think  
9 when you are making these studies, it doesn't have to do with  
tagging.

10 CHAIRMAN JENSCH: Thank you. Now I wonder if  
11 the reporter would read the question to the witness.

12 (The reporter read the following question: "Now,  
13 Dr. Goodyear, would you say that meristic studies very clearly  
14 demonstrated whether the striped bass which reside in the  
15 lower part of the Hudson River south of Haverstraw Bay during  
16 the winter are of southern origin, such as the James River  
17 or the Chesapeake Bay?")

18 CHAIRMAN JENSCH: If there is a comment on the  
19 study, is it reflected in a document he could review to arrive  
20 at some conclusion in that regard? Or can you identify the  
21 studies so he is not trying to use total recall on this?

22 MR. TROSTEN: Let me see if I can find the particu-  
23 lar place I had in mind. My basic question, really, and again  
24 I will state the reason why I am asking the question and maybe  
25 this will help Dr. Goodyear to understand what I am getting at.

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1 I understand that there is a significant question as to the  
2 racial identify, that is which river these fish come from,  
3 of the striped bass which inhabit the lower part of the Hudson  
4 River during the wintertime. There are populations that move  
5 along the Atlantic Seaboard, populations of striped bass,  
6 which move into the rivers here during the wintertime, and  
7 my question to him was -- I will see if I can find some  
8 reference to this in the testimony -- whether he is aware  
9 whether meristic studies have demonstrated what the racial  
10 identity is of these over-wintering populations in the Hudson  
11 River, these populations, that is, which are assumed to move  
12 upstream during the springtime, and spawn in the Hudson River.

13 CHAIRMAN JENSCH: You used the word "clearly  
14 shown" and I didn't know whether that might be a problem for  
15 the witness.

16 THE WITNESS: The basic problem is that I am not  
17 aware right offhand of any studies of the meristic character-  
18 istics of the migratory sized striped bass in the Hudson.

19 BY MR. TROSTEN:

20 Q I am not either, really, of this area here in the  
21 lower Hudson Bay. That is what you are referring to, is that  
22 correct?

23 A Right.

24 Q Now that being the case -- that was the problem I  
25 was having looking for something in the testimony, because I

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1 don't think there is anything that does show this -- if you  
2 don't have these meristic studies of fish that inhabit  
3 the lower portion of the Hudson River in the wintertime,  
4 does that mean that the fish that are over-wintering in the  
5 Hudson River in the wintertime, any fish that may be found  
6 there, could be of Chesapeake Bay origin or James River  
7 origin, for example?

8 CHAIRMAN JENSCH: I wonder if I could have that  
9 question reread? As I understood the predicate it was do the  
10 meristic studies show the fish came, the fish that over-  
11 winter there, came from southern origin. Now as I understand  
12 it there aren't any such studies. So then I don't understand  
13 the last question. Would you read that question, please?

14 (The reporter read the pending question.)  
15 CHAIRMAN JENSCH: Does your question then raise a  
16 question of possibility, but not probability?

17 MR. TROSTEN: It raises the question of whether  
18 this is a possibility, yes.

19 CHAIRMAN JENSCH: But did you ask him to comment  
20 on whether it is probable or not?

21 MR. TROSTEN: I wasn't asking him to comment on  
22 whether it is probable or not, because I guess it would be  
23 fair to assume from what Dr. Goodyear has said before that  
24 on the basis of his analysis of the tagging studies of fish  
25 that leave the Chesapeake Bay, I guess he would say that it

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1 wouldn't be probably, although I don't know, I suppose we  
2 probably ought to ask him that. Why don't we try probability  
3 first and then ask him possibility?

4 CHAIRMAN JENSCH: Proceed.

5 THE WITNESS: I would expect some of those fish  
6 would be of Chesapeake origin. The exact percentage would be  
7 a difficult thing to ascertain. The larger the fish, the  
8 more likely it would have been from the Chesapeake.

9 BY MR. TROSTEN:

10 Q You are not prepared at this point to speculate  
11 as to what percentage of the over-wintering population in the  
12 Hudson River is of Chesapeake origin?

13 A I have no way of knowing.

14 DR. GEYER: I need to ask a question for  
15 clarification, if I may. Does the presence of these fish in  
16 the lower Hudson in the wintertime necessarily mean that they  
17 spawned in the Hudson?

18 THE WITNESS: No. If they did spawn and they  
19 were from Chesapeake origin, it still wouldn't make much  
20 difference to the analysis. Except for one thing, it  
21 would mean there would be a contribution from the Chesapeake  
22 to the spawning potential of the river which would modify  
23 the feedback system and reduce the population. It also should  
24 show up as indicating in the meristic characteristics, tend  
25 to blend the characteristics together, but nobody has done any

1 studies in a long time on the meristic characteristics of the  
2 fish in the river.

3 DR. GEYER: If there were enough tagging, it  
4 should show up in the tagging studies as far as fish found  
5 in the spawning area are concerned?

6 THE WITNESS: Well, if there were a very large  
7 proportion showing up, it should show up in the tagging  
8 studies, yes.

9 DR. GEYER: Thank you.

10 BY MR. TROSTEN:

11 Q Now, Dr. Goodyear, you indicated a moment ago that  
12 the combined sport and commercial catch in the Mid Atlantic  
13 region might be anywhere from 1.5 million to 3 million, in your  
14 judgment. Is that correct?

15 A Something like that.

16 Q Now --

17 A With the reservation I gave.

18 Q Yes. Now if that catch could be significantly --  
19 if the total catch could be that much greater than the com-  
20 mercial catch which you analyzed in making your regression  
21 analysis, could that distort the regression analysis?

22 In other words, if there was a catch which is not correlated  
23 in your regression analysis that you made, which was strictly  
24 relating commercial in the Mid-Atlantic to commercial in the  
25 Hudson, would that in your view tend to distort your

8mil

1 regression analysis?

2 A Distort in what way? I don't think so.

3 Q I don't think so; all right.

4 A I don't know how. What do you mean exactly by  
5 distort?

6 Q Well, I am sort of asking you a layman's question,  
7 Dr. Goodyear. Perhaps I can just ask it and you can answer  
8 it and we can go on. If you made a regression analysis which  
9 takes a figure of 500,000 to 1 million commercial catch annually  
10 in the Middle Atlantic region, and you related that to the  
11 catch in the Hudson River and formed a relationship, analyzing  
12 the variances between the two, and there is another figure  
13 lurking in the background, so to speak, of a much higher  
14 commercial catch, which is not taken into account in the  
15 regression analysis, would that tend to distort the relation-  
16 ship which you have drawn, or would that tend to cast some  
17 question on the relationship you have drawn?

18 MR. MACBETH: Just so we have this clear on the  
19 record, you must have meant a much larger sports catch, when  
20 you got halfway through the question, you said a much larger  
21 commercial catch.

22 MR. TROSTEN: Much larger sports catch.

23 THE WITNESS: No. What you would expect to happen  
24 would be that the sport and commercial catch would proportion-  
ately change with the change in stock. And the change is what  
25 the regression analysis is based on.

#8  
arl

1 BY MR. TROSTEN:

2 Q Now, Dr. Goodyear, have you plotted the catch  
3 in the Chesapeake Bay relative to the catch in the Hudson  
4 River? I am sorry, the catch in the Chesapeake Bay relative  
5 to the catch in the middle Atlantic?

6 A Yes.

7 Q Do you know if a similar correlation can be shown  
8 to the one that you showed in Figure 5-12 through 5-15?

9 A I am not sure exactly what the comparison was, but  
10 it is a highly -- the regression analysis is also highly  
11 significant to almost the same degree.

12 Q It is almost the same degree as the relationship  
13 shown between the Hudson River and the middle Atlantic?

14 A Right. There are a couple of problems that turned  
15 up when I did that analysis. One of them was that the inter-  
16 sect of the regression line on the "Y" axis was less than  
17 zero, it was negative. It becomes very hard to postulate  
18 the mechanism which could contribute to the Atlantic fishery  
19 with a line of the form that was present in that regression  
20 analysis. Again the reason for accepting or rejecting the  
21 analysis is not solely related to the R-square value. You  
22 don't accept the hypothesis based on a regression analysis,  
23 you simply don't reject it.

24 Q Yes, you made that clear before, that you simply  
25 did not reject the contribution of the Hudson to the middle

ar2

1       Atlantic region on the basis of your regression analysis  
2       on pages 12-36 and 12-38, you didn't derive that hypothesis  
3       from that regression analysis. Is that true?

4           A      Right.

5           Q      All right. Now, could you, through your counsel,  
6       provide us with the regression analysis which you performed  
7       on the Chesapeake Bay and the middle Atlantic populations  
8       so we could have that?

9           A      I have one here, I believe, if you want to look at  
10       it.

11          Q      It won't do me much good to look at it, I am afraid.  
12       But if we could have it by this evening, I would appreciate it.

13          A      Certainly.

14          Q      Thank you.

15          A      There are several other things that ought to be  
16       pointed out about that, since we might not get back to it.  
17       The degree to which the correlation should exist between  
18       the Chesapeake catch and the mid-Atlantic catch, assuming  
19       that the Chesapeake was producing all of the stock, should  
20       be actually greater than the one which was presented from  
21       the Hudson landings, simply because there is only a two-year  
22       lag between the time that the fish would have been caught  
23       in the Chesapeake or the stock reaches catching size in  
24       the Chesapeake and the time the stock reaches catching size  
25       in the Atlantic. There is a two-year lag at that point.

ar3

1 which are in phase, so you do get the highest regression  
2 analysis values for that time period.

3                 However, the correlation really is not as good  
4 as the one in the Hudson, which has a six-year lag, and  
5 presupposes that the spawning, the eggs which are spawned,  
6 are the ones that are recruited to the fishery five years  
7 later, not the actual fish themselves. So that the relation-  
8 ship is one that has multiple steps in it in the Hudson regres-  
9 sion, whereas in the Chesapeake data, the assumption for  
10 the regression analysis is that the fish themselves are an  
11 index, the same stock is being caught in both places, rather  
12 than stock that is produced by the measurement for the  
13 independent variable.

14                 Q      Dr. Goodyear, I may want to question you additionally  
15 with regard to the regression analysis after I have had an  
16 opportunity to consult with Dr. Lawler with regard to this.  
17 I want to ask you a question about page 5-56 that does not  
18 relate to the regression analysis.

19                 Do you agree that there has been an order of  
20 magnitude increase in the Atlantic Coast striped bass popula-  
21 tion in recent years?

22                 A      By recent, do you mean 50 years, 30 years?

23                 Q      The period covered by Koo in his article.

24                 A      Yes.

25                 MR. MACBETH: Just for the record, and the rest of

ar4

1 us, what was the period covered by Koo in his article?

2 THE WITNESS: Well, the primary data he presented  
3 and analyzed was from 1930 on. However, he did present  
4 data which date as far back as it was gathered. But the  
5 principal analysis was from 1930 to the present, or to 1966.

6 BY MR. TROSTEN:

7 Q Now, does this not mean, Dr. Goodyear, that the  
8 population has been expanding despite predation by the fishery?

9 A Yes.

10 Q Now could you tell me what, in your view, is the  
11 overall trend of fishing efforts for striped bass over the  
12 period from 1947 to 1966 in New York waters? As shown by the  
13 data that you supplied to us with your underlying calculations  
14 for Figures V-12 to V-15?

15 A From '47 to '66?

16 Q Yes.

17 A The trend was down.

18 Q It is true, is it not, that the New York fishing  
19 efforts for 1966, as compared with 1947, is approximately  
20 one eighth as large? Would you accept that subject to further  
21 check?

22 A Yes.

23 MR. MACBETH: Could we be clear about this? You  
24 are now talking about commercial fishing?

25 MR. TROSTEN: Right.

ar5

1 THE WITNESS: And New York waters.

2 MR. TROSTEN: Right.

3 BY MR. TROSTEN:

4 Q Now the trend in fishing efforts in the Hudson  
5 River between 1935 and 1965 is steadily downward, is it not,  
6 again the commercial fishing effort?

7 A I don't believe so. I could tell you in a couple  
8 of minutes.

9 Q Yes. Do you want to refer to your response --

10 A There is a general trend, but not a steady trend.

11 Q A general trend downward. Did I say steady trend?  
12 This would be it, wouldn't it, Table 1?

13 (Handing document to the witness.)

14 A No, that is the catch.

15 Q I am sorry. Here is your New York striped bass --

16 A This is again Long Island, not the Hudson River.

17 Q All right. Do you have the data?

18 CHAIRMAN JENSCH: This is for the 30-year period?

19 MR. TROSTEN: Yes, sir, 30 years, '36 to '65.

20 CHAIRMAN JENSCH: Just offhand, while he is looking,  
21 can you tell me how you selected that period? Is that  
22 representative? Did you find in the last two years it has  
23 gone up?

24 MR. TROSTEN: The reason for selection of it is  
25 this is within the range covered by Koo in his discussion.

1 It may be that the range where the data are readily available,  
2 but I am not absolutely sure.

3 CHAIRMAN JENSCH: In view of the qualification  
4 by the witness that it has been a general trend, but not a  
5 steady trend, I take it there are jiggles in the line.

6 MR. TROSTEN: I think so. Perhaps you could give  
7 us an indication of this, Dr. Goodyear. Why don't you just  
8 characterize the trend from the data you have? What are you  
9 reading from?

10 THE WITNESS: This is the data that was summarized  
11 by the Hudson Valley Commission. Some of the material I  
12 presented to you sometime ago. This particular table is  
13 Table 4 of that document. It is entitled "Data Pertaining  
14 to the Shad Taken in the Hudson Stack and Drift Net Between  
15 1924 and 1963." This information was used to analyze the  
16 importance of fishing intensity for shad. You might remember  
17 that the striped bass which are taken in the Hudson are  
18 principally taken by the shad fishery. In looking at the  
19 data from 1935, the intensity rose until 1946 and from that,  
20 or '47, and from that point on it has declined.

21 BY MR. TROSTEN:

22 Q Thank you.

23 In his article, Koo describes the trend in the New  
24 York and mid-Atlantic striped bass population from 1947.  
25 to 1966, as generally a healthy increase in abundance, isn't

1       that true?

2           A      Yes.

3           MR. TROSTEN: May I have a moment, Mr. Chairman?

4           CHAIRMAN JENSCH: Since there is a pause, would  
5       you like to take the recess at this time?

6           MR. TROSTEN: Yes, Mr. Chairman.

7           CHAIRMAN JENSCH: What time do you want for a  
8       recess?

9           MR. TROSTEN: If we could come back at 1:00  
10       o'clock, Mr. Chairman, I think that would be helpful.

11          CHAIRMAN JENSCH: At this time let us recess to  
12       reconvene in this room this afternoon at 1:00 o'clock,

13          (Whereupon, at 11:45 a.m., the hearing was recessed,  
14       to reconvene at 1:00 p.m., this same day.)

1 mil

1                   AFTERNOON SESSION

2                   (1:00 p.m.)

3                   CHAIRMAN JENSCH: Please come to order.

4                   MR. TROSTEN: Mr. Chairman, in view of the  
5                   schedule shifts, we are trying to accommodate this and work  
6                   it out as best we can. I gather that this building will be  
7                   closed at noontime. And Mr. Macbeth has been preparing  
8                   on the assumption he would not start until tomorrow morning.  
9                   So he would prefer not to start until tomorrow morning.  
10                  I thought maybe he might come in briefly this afternoon.  
11                  But I think, all things considered, the best thing for me to  
12                  do now would be to terminate my examination at this point  
13                  and let Dr. Lawler commence the examination we had been  
14                  planning with respect to Dr. Goodyear.

15                  CHAIRMAN JENSCH: I think this, that no party in  
16                  this proceeding should feel limited as to time. We will  
17                  provide the time necessary for anybody to cross-examine.  
18                  There may be some repeated presentations by the witnesses,  
19                  but we will just have to recognize that. And the fact that  
20                  the building will be closed tomorrow, as long as we are  
21                  contemplating a two-week session in March, the witnesses will  
22                  have to accommodate themselves to this fact.

23                  MR. TROSTEN: All right. Why don't we start  
24                  with Dr. Lawler then?

25                  CHAIRMAN JENSCH: We might consider in the meantime

1 that we will start in the morning at 8:45 and recess at 11:45.

2                                  Very well, Dr. Lawler. Will you process, please.

3                                  Before we begin, the Board would like to inquire  
4 of the Staff as to how they are progressing on the calcula-  
5 tions that they are making or the considerations that they  
6 are going to reflect in this proceeding, especially as to the  
7 Roseton and Bowline plants.

8                                  MR. LYLE: With regard to Roseton and Bowline,  
9 I would like to reiterate, first of all, our feeling as  
10 expressed in the final environmental statement on XII-43, the  
11 Commission does not have the jurisdiction and therefore it  
12 does not have a responsibility to consider these plants.

13                                CHAIRMAN JENSCH: We won't have to go through that.  
14 The Board doesn't give much reliability to that situation  
15 and we have requested the data, so let's start from there.  
16 The only question is when will the data be presented.

17                                MR. LYLE: We have some raw data at this point  
18 which have not been fully evaluated to present to you at  
19 this point a Staff evaluation of it. That is in the works  
20 and it should be forthcoming in the very immediate future.

21                                CHAIRMAN JENSCH: Now that is a generality that  
22 doesn't assist a great deal. Can you give us a date?

23                                MR. LYLE: I cannot at this point, sir, because I  
24 don't know how many people are going to have to look at that

25                                CHAIRMAN JENSCH: Perhaps you could have some

3mil 1 report in the morning. We would like to have it in sufficient  
2 time before the March 5 reconvening, so that we have a chance  
3 to study it.

4 MR. KARMAN: I think we can accommodate you on that.

5 CHAIRMAN JENSCH: Thank you.

6 Dr. Lawler.

7 Whereupon,

8 CHESTER P. GOODYEAR

9 resumed the stand, and, having been previously duly sworn,  
10 was examined and testified further as follows:

11 CROSS-EXAMINATION (continued)

12 BY DR. LAWLER:

13 Q What I will try to do during the course of the  
14 cross-examination, Dr. Goodyear, is identify the objective of  
15 a particular sequence of questions. This first sequence of  
16 questions is simply to distinguish between the objectives of  
17 the models presented in Appendix V-2 and the models presented  
18 in Appendix V-3. You present an entrainment analysis in  
19 Appendix V-2 and also in Appendix V-3. Is that not correct?

20 A That is true.

21 Q Your analysis in V-2 appears to be general in nature  
22 and appears to be proposed as applicable in a general sense  
23 to any entrainable organism in the river. Is that not true?

24 A Any passive organism.

25 Q Any passive organism, fine. Now this discussion in

4mil

1 v-2 and the models proposed therein appear to deal specifically  
2 with the passage of Hudson River water and accompanying  
3 organisms past the Indian Point plant itself. Is that not  
4 true?

5 A That is true.

6 Q And no model which characterizes the behavior of  
7 the whole river is presented in that appendix, correct?

8 A That is correct.

9 Q Now in Appendix V-3 you present a model of the  
10 entire estuary, or at least the major portion of it? It  
11 extends from the battery on the south, northward up to I  
12 would say Coxsackie or thereabouts. Is that correct?

13 A That is true.

14 Q And you use this model specifically to evaluate  
15 the influence of entrainments of striped bass by the Indian  
16 Point plant, is that not correct?

17 A That is true.

18 Q Not it is this later model, this model presented  
19 in Appendix V-3, from which you make your estimate of the  
20 entrainments effect of the plant, as stated in the summary page  
21 iii in paragraph 3(j)(2)--

22 CHAIRMAN JENSCH: Could you help us on this  
23 identification? We are having a little trouble with your  
24 Appendix B-2 and B-3. Is it "B" as in "boy"?  
25 DR. LAWLER: It is Roman V. I am sorry. May I use

5mil

1 the word "V"? It is shorter than saying Roman five.

2 CHAIRMAN JENSCH: Oh, yes, now that we understand.

3 DR. LAWLER: That starts on page A-5-36, and goes  
4 through A-5-51. And then Appendix V-3 picks up on A-5-52 and  
5 continues through pages A-5-97.

6 CHAIRMAN JENSCH: Thank you.

7 BY DR. LAWLER:

8 Q Now a moment ago I turned to the summary page iii,  
9 and I am referring to a statement made under paragraph 3(j)(2)  
10 which states, "The Staff analysis further indicates that  
11 during June and July of most years from 30 to 50 percent  
12 of the striped bass larvae which migrate past Indian Point  
13 from upstream spawning areas are likely to be killed by  
14 entrainment." I ask you, Dr. Goodyear, is it not the model  
15 that is presented in Appendix V-3 from which this statement  
16 is made or upon which this statement depends?

17 A Not entirely. The model that is in that appendix  
18 is used within the statement to support the numbers. But there  
19 are many more assumptions and factors that are involved in the  
20 conclusion than are a portion of the model itself.

21 Q Well, do you mean by that the notions that go into  
22 developing the model in V-3 are presented elsewhere, for  
23 example, first in V-2?

24 A Some of them are, yes.

25 Q Some of them are.

6mil

1           A       Many of the biological factors are not considered  
2       in the model at all. They are a part of the appendix, but  
3       not really a part of the model. In other words, the elimina-  
4       tion of a factor, once it is eliminated as an important  
5       factor, it then does not enter into the model at all in any  
6       form except as an assumption. But as a numerical input of  
7       any kind it doesn't exist.

8           Q       I think I know what you mean. Maybe I can clarify  
9       it by a question. I don't know the exact location at the  
10      moment, but I think everyone will identify with it. At some  
11      point in the text you conclude that 70 to 90 percent of the  
12      planktonic forms or early forms will pass the Indian Point  
13      plant in that form. I don't recall exactly how you phrased  
14      it. Yes, you say "70 to 90 percent of the surviving portion  
15      of the total annual production of young bass had migrated  
16      past Indian Point by late July or early August." It seems to  
17      me that that is the basis for your -- or one of the bases  
18      for your model presented in V-3, in which you concern yourself  
19      with entrainment of the planktonic forms for a period of eight  
20      weeks. In other words, you suggest that the organisms have  
21      passed the plant by late July or early August and therefore  
22      there is an eight-week period over which they are passing  
23      the plant in an early or planktonic form.

24           A       I have several comments about what you just said.  
25       Firstly, the particular passage of the 70 to 90 percent you

7mil 1 are speaking of is in reference to 1968 data only.

2 Q Yes, I understand that.

3 A It refers to that. It would not be reasonable to  
4 assume that other years would have exactly the same rate  
5 or proportion of population passing. Principally because 1968  
6 happened to be a high flow year. So that number really  
7 doesn't reflect what one could consider normal circumstances.

8 Actually the model itself -- we went over this once before  
9 today -- but the model itself does not utilize information  
10 such as you are speaking of, doesn't utilize, for instance,  
11 the eight-week period being June and July. The eight-week  
12 period comes from other information not associated with the  
13 time that it takes the fish to migrate past the plant. The  
14 eight-week period comes from the behavioral information, the  
15 growth rate information, the fact that the period of migration  
16 is eight weeks, around eight weeks, coincides with the  
17 reason the eight weeks was selected and helps support it, but  
18 it wasn't the only thing used to support it, the reason for  
19 that being it is impossible to know the age and the time that  
20 any one fish was spawned, or the major proportion of the fish  
21 actually that were spawned that are migrating past the plant  
22 looking at just the data or, for instance, trawl catches in the  
23 Haverstraw area. That information can't be used for that  
24 purpose. It does support a period of from six to eight weeks  
25 as being the period of passing migration, if you will.

8mil

1 There was one other point -- could I hear what --

2 MR. LYLE: Do you want the question read again?

3 BY DR. LAWLER:

4 Q Let me pick up on the few points you just mentioned.

5 I was simply trying to use the statement of the 70 to 90  
6 percent as possibly one of the additional thoughts or pieces

7 of information that went into not simply the conclusion I  
8 refer to, but which was background for your model. I realize  
9 the 70 and 90 percent does not appear anywhere in the model.

10 I was simply suggesting that isn't the 70 to 90 percent or  
11 something of that nature a part of your support for a model  
12 which has most of the organisms in the river passing the

13 Indian Point plant in an early or planktonic form? I am not  
14 trying to argue the point whether it is or not, I am simply  
15 trying to clarify where your statement is coming from.

16 A The 70 to 90 percent figure applies only to the 68,  
17 or flow conditions like that. That condition is not even a  
18 part of the assumptions that are inherent in the model itself.  
19 That condition does not have to be met. You are quite right,  
20 that that is an example of the kinds of thing that is used to  
21 evaluate the information.

22

23

24

25

1           Q     Fine. That is all I wanted to know. Let me  
2       rephrase my question then. In your statement that the Staff  
3       analysis further indicates that during June and July of most years,  
4       from 30 to 50 percent of the striped bass larvae which migrate  
5       past Indian Point from upstream spawning areas are likely  
6       to be killed by entrainment, is not that 30 to 50 percent estimate  
7       a result of the analysis shown in Appendix 5-3? In other words  
8       you use a number. I want to know where the number comes  
9       from.

10           MR. MACBETH: Could we let the witness answer the  
11       question. I find it confusing in the record after a while  
12       if there is a second question or restatement.

13           THE WITNESS: I tried to indicate a moment ago that  
14       the answer to the question is that the numbers themselves are  
15       predicted by the model in the appendix. But that is not  
16       the sole support for those numbers.

17           BY MR. LAWLER:

18           Q     But the numbers as numerical entities are  
19       things that come out of the model?

20           A     Yes.

21           Q     Thank you. The only reason for this question is  
22       I wasn't aware of it until after I constructed the sequence  
23       of questions I just read to you, but on page V-48 in the  
24       Final Statement, the same statement that I just read from  
25       the summary also appears word for word in the first sentence

1 of the third paragraph. And then there is a parenthetical note  
2 that says, "See Appendix V-2." But I think that has been correc-  
3 ted to V-3 in the corrections to the text.

4 A Right.

5 Q So, therefore, these numbers, as numbers, do come  
6 from the model presented in Appendix 5-3?

7 A Yes.

8 Q Thank you. The reason for that line of  
9 questioning is simply to determine where the numbers come from.  
10 I was pretty certain that it was model 5-3 from which those  
11 numbers come, and the remaining questions this afternoon  
12 deal primarily and almost exclusively with 5-3 rather than  
13 with 5-2.

14 Now, the next sequence of questions is to establish  
15 the definition of percentage reduction and to determine  
16 whether that definition of percentage reduction is consistent  
17 with the percentage reductions used in both the Applicant's model  
18 and in the Intervenors' model. The purpose for this is simply  
19 to be able to make a comparison between the three models  
20 that have been entered in evidence. Now, when you say, "which  
21 migrate past," --

22 MR. KARMAN: Where are you quoting from, Dr. Lawler?

23 DR. LAWLER: Excuse me. The statement on

24 page 5-48, the third paragraph, the first sentence. It  
25 begins, "The Staff analysis indicates" and then deals with the

1 30 and 50 percent, and says, "which migrate past Indian  
2 Point from upstream spawning areas." The next series of  
3 questions focus on this statement, "Which migrate past Indian  
4 Point from upstream spawning areas."

5 BY DR.LAWLER:

6 Q By that statement, do you not imply that not  
7 all of the striped bass spawned above Indian Point pass  
8 Indian Point in an entrainable stage?

9 CHAIRMAN JENSCH: Didn't we go over this this  
10 morning? The witness indicated that there was no  
11 indication from this sentence of the total population, but  
12 his statement was whatever does pass, 30 to 50 percent are  
13 likely to be killed by entrainment. So it was also negative,  
14 your premise and your statement. You weren't here this morning  
15 in the hearing room.

16 DR. LAWLER: No, it was not. But that would answer  
17 my question.

18 CHAIRMAN JENSCH: Yes, proceed.

19 BY DR. LAWLER:

20 Q In your model, at least, you do consider that  
21 all of the spawn or virtually all of it takes place above  
22 Indian Point, is that not correct?

23 A Virtually all of it, yes.

24 Q Now, I want to refer to to Table A-5-16 --

25 DR. GEYER: On what page is that?

eak4

1 DR. LAWLER: It is on page A-5-85.

2 BY DR. LAWLER:

3 Q Do you have that page?

4 A Yes.

5 Q You have two bases for percentage described  
6 in this table. This is the fifth column. You say bases  
7 of percentage and one base is defined as total and the other  
8 base is defined as nursery. Then associated with each base  
9 you have an associated percentage reduction for each week after  
10 spawning. Does not nursery, as used here, apply to segments  
11 12 through 19 in your model? Those are the segments that  
12 begin in the vicinity of Indian Point and move all of the way  
13 down to the Battery.

14 A I really have to look at the program to get it  
15 straight, but I believe you are right. It would either be  
16 starting with 12 or starting with 13. But the number itself  
17 would be the same virtually.

18 Q My reading of your program is it starts at  
19 12 and goes through 18. It goes from 12 to 18. But my  
20 point is what you are describing as nursery is the zone from  
21 Indian Point down river?

22 A Right.

23 Q And effectively includes Haverstraw and Tappan Zee?

24 A Right.

25 Q Now, do not the percentage reductions designated

1 as nursery simply correspond to the reduction in the population  
2 in segments 12 through 18?

3 A That is correct.

4 Q In the reach lower Indian Point. Fine. Now, does  
5 not the larval population in this reach correspond to that  
6 portion which actually passes the plant? What I mean by that  
7 is that you spawn all of the -- the spawn is all upstream of  
8 Indian Point, so the population in the nursery zone must be  
9 those which have passed the plant. Would you not agree?

10 A All of those did pass the plant. Others also may  
11 have been under the influence of the plant, within the  
12 plant sector, and have been transferred upstream. In other  
13 words, what I am saying is I really can't answer your question  
14 directly yes or no, because all of them that are downstream  
15 obviously passed the plant in an entrainment state.

16 However, a portion of the population which has been  
17 exposed to plant operations has not passed downstream but is,  
18 at the termination of the eight weeks, is upstream from Indian  
19 Point.

20 Q I understand that.

21 A It is just the wording of the question.

22 Q I am referring back now to the statement, "which  
23 migrate past the plant." I will connect this up in a moment.  
24 Then, it seems to me when you say that 30 to 50 percent which  
25 migrate past the plant, you are referring to the reduction of

1 of population in the nursery area.

2 A That is correct.

3 Q Are you familiar with the models that have been  
4 proposed by the Applicant as well as by the Intervenor?

5 A Yes.

6 Q These models assess the impact of the plant in  
7 terms of reduction in the estuary population of various  
8 life stages of the Hudson River striped bass. Would you agree  
9 with that statement?

10 A Yes, I would like to point out also that the table  
11 that you are referring to here, V-16, the first row for each  
12 condition that was modeled, which says total, reflects the  
13 total population rather than just the nursery area itself.

14 Q Yes, I understand that. I will get to that in a  
15 moment. You anticipated my question. It reads thusly, is  
16 not the base for percentage in your Table A-5-16, designated  
17 total, more useful for comparison of your estimate of impact  
18 with those of the Applicant and the Intervenor?

19 A Yes.

20 Q Is not the total base a better indicator of the  
21 effect of the plant on the Hudson River striped bass population?

22 A Yes.

23 Q I will get back to a discussion of the actual  
24 results in the table later on. But what I am simply trying  
25 to establish here is that the thing that seems of interest to me

1 is to discuss the comparison in terms of total rather than  
2 nursery, for two reasons, one being that the other models  
3 introduced look at it that way, and secondly, what we are  
4 interested in is the impact of the plant on the river as a  
5 system or as a whole.

6 A I agree entirely. The reason for including the  
7 nursery area as a separate configuration here is that it is  
8 probably that the mortality rates in the various reaches  
9 of the river are different. It depends somewhat on the  
10 available habitat and the crowding within that  
11 habitat. So that the nursery area reduction may be a better  
12 indication, although for the rest, for all of the conclusions  
13 that were reached in the ultimate sense, the total figures  
14 were the ones that were consulted, rather than the percent  
15 reduction in the nursery itself.

16 Q Presuming we know that there is a difference  
17 in mortality, let's say from area to area.

18 A Well, the reason that the nursery area reduction  
19 was projected as a final conclusion was there isn't any way  
20 to evaluate presently the influence of river location on  
21 mortality. So those numbers were considered to be less useful  
22 for the discussions as is in the statement, the final conclu-  
23 sions in the statement are not based on the nursery area itself,  
24 reductions in the nursery. It is based on the total reduction.

25 Q Are you saying to me that the 30 to 50 percent numbers

1 are based on the total and not the nursery?

2 A Yes. It is true for both.

3 Q I thought you just said a moment ago the 30 to 50  
4 percent numbers were those which migrate past the plant  
5 and in turn those which migrate past the plant  
6 are those which are the population of the nursery area or  
7 the zone in the river below Indian Point defined by yourself  
8 as nursery.

9 A The statement that you are reading from in the  
10 text was referring primarily to those organisms.

11 It was in reference to those which passed the plant. The same  
12 range of numbers applies to the percent reduction in the  
13 total population as well.

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1           Q     Let me ask this question, then: If you are saying  
2     that the same range of numbers applies to the reduction in  
3     the total population as well, do you present a set of calcula-  
4     tions that identify the numbers 30 to 50 percent as associated  
5     with the total, with the reduction in the total estuary as  
6     opposed to the reduction in the nursery area?

7           A     The computations?

8           Q     Yes.

9           A     I don't understand exactly what you mean. The  
10   values are presented in the table.

11          Q     Excuse me.

12          A     The values are presented in the same table.

13          Q     Yes, but the values presented under "total"  
14   are substantially less than, in my estimation, or at least  
15   in many cases, than the values presented in nursery. And in  
16   looking at these numbers, it seemed to me that the 30 to 50  
17   percent range is a range that one can identify with the nursery  
18   values, as you go down the table. And secondly, the statement  
19   "which migrate past Indian Point" being identified with the  
20   30 to 50 percent also seems consistent with identifying the  
21   30 to 50 percent with the nursery areas as just indicated.

22                 MR. TROSTEN: May I just ask a question, Mr.  
23                 Chairman?

24                 CHAIRMAN JENSCH: Surely.

25                 MR. TROSTEN: I have just been glancing at this.

ar2

1 Isn't 39 percent for the total about the highest? Maybe  
2 that is the highest for total? I was just looking at it  
3 and it would help me if I could understand that.

4 MR. KARMAN: Where are you reading from?

5 MR. TROSTEN: Run 21.

6 MR. MACBETH: Try line 40.

7 MR. TROSTEN: 40.28. Thank you. Are there any  
8 higher than that, Dr. Goodyear?

9 THE WITNESS: They don't seem to be in the table,  
10 no. There were runs which were higher than 50 percent.

11 BY DR. LAWLER:

12 Q For the total?

13 A For the total. These actually represented a  
14 sampling of the runs or the sets of conditions that were  
15 inputs. I didn't realize that the highest one wasn't in there.

16 Q Aren't these sets of runs that are presented in the  
17 final detailed statement runs considered to be by the Staff  
18 as representative of what may happen in the river?

19 A They are representative, yes, of the runs that  
20 were made. Now the selection of which ones of these are  
21 valid to extract conclusions from comes from comparison of  
22 the distribution of -- well, it is essentially the comparison  
23 of the distribution at the end of eight weeks and four weeks  
24 to the distribution in the river, as has been measured for  
25 similar conditions. In other words, the values, not all of

ar3

1 these can be used to conclude that that number that is  
2 predicted is applicable number, because some of the distribu-  
3 tions, for instance, are not consistent with the data from  
4 field collections.

5 Q Well, I am simply trying to determine whether the  
6 30 to 50 percent number as a number, as a computable  
7 entity, is to be associated with the nursery area or whether  
8 it is to be associated with the total population?

9 A It is to be associated with the total population.  
10 Let me make a point. I guess it is kind of misleading. The  
11 percentage reduction in the nursery area, as you can see  
12 within that table, is about 30 to 50 percent also. The most  
13 valid runs, the ones that were considered to be the closest  
14 to the fish distribution, also fell in that range for the total  
15 reduction. And the conclusion about what percentage of the  
16 recruitment might be lost is based on the total reduction  
17 rather than the reduction in the nursery area.

18 Q If those runs that were considered to be most  
19 representative of the situation show 30 to 50 percent for  
20 the total, then my question is why haven't they been included  
21 in the final statement?

22 A Most of them have.

23 MR. TROSTEN: Mr. Chairman, may we be provided  
24 with -- or Mr. Karman, may we be provided by the Staff with  
25 all runs that show a reduction higher than 40 percent, roughly,

ar4

1 whatever that number was we were reading a moment ago for  
2 the total nursery area, or for the total area, excuse me.

3 MR. KARMAN: I am certain we have it available,  
4 and Dr. Goodyear has indicated if they are, we certainly will  
5 furnish them.

6 MR. TROSTEN: Thank you.

7 DR. LAWLER: I will leave that topic for a moment.

8 At this point, Mr. Chairman, there are a number of -- what I  
9 would like to do is clarify several of the physical aspects  
10 of the model, those things one looks at as he constructs the  
11 model. I think I can best do this by sketching some of these  
12 on the board and asking Dr. Goodyear whether he agrees or dis-  
13 agrees that these concepts do in fact reflect his model.

14 CHAIRMAN JENSCH: Proceed.

15 BY DR. LAWLER:

16 Q Now it is my understanding that the model consists  
17 of a number of, a mathematical description of various physical  
18 phenomenon that take place in the estuary, both from a  
19 hydraulic or flow standpoint and also from the standpoint of  
20 the behavior of the organisms. Is that correct?

21 A True.

22 Q And it is my understanding that basically if we  
23 sketch a longitudinal section (drawing on board) -- section  
24 of the river in which this is the direction toward the ocean,  
25 that you have incorporated in your model the so-called notion

ar5

1 of net nontidal flow or density circulation, which is introduced  
2 by salt profiles in an estuary. To do that, you simply  
3 split the estuary into an upper layer and a lower layer.  
4 And in doing so, you recognize a net seaward movement in  
5 the upper layer, and a net landward movement in the lower  
6 layer. Is that true?

7 A That is true.

8 Q Now would you not agree that this is the result  
9 that one obtains when one looks at the real time tidal motion  
10 and then integrates it out or looks at it over the entire  
11 tidal cycle, the net result of which is to yield a motion  
12 seaward in the upper layer and landward in the lower layer?

13 MR. TROSTEN: Dr. Lawler, excuse me, before Dr.  
14 Goodyear answers, would you, in referring to the diagram on  
15 the board that you have drawn, make an effort to refer  
16 specifically to the designations in the diagram? Because what  
17 I propose to do, Mr. Chairman, is to have this sketch  
18 reproduced and offer it for inclusion in the record so the  
19 record will be clear on this discussion.

20 DR. GEYER: This appears on A-5-83.

21 MR. TROSTEN: Yes, there is a sketch in here. I  
22 am not sure whether Dr. Lawler is really going to refer to  
23 that sketch or draw something somewhat different.

24 DR. LAWLER: I think I can refer to that sketch  
25 from time to time, but there are a few other points I would

ar6

1 like to introduce and that is the reason for using the black-  
2 board.

3 BY DR. LAWLER:

4 Q Now with respect to this tidal motion that I just  
5 referred to --

6 MR. MACBETH: Wasn't there an outstanding question?

7 THE WITNESS: I answered it yes.

8 BY DR. LAWLER:

9 Q With respect to the tidal motion I just referred to,  
10 I would ask you whether or not you would agree that it can be  
11 shown pictorially in the following manner? That if one takes  
12 the ebb portion of the tide and draws the velocity profile  
13 from the surface to the bottom, one will generally see a  
14 profile that shows a maximum velocity horizontal-longitudinal  
15 velocity at the surface and drops off gradually to a zero  
16 velocity at the bottom of the river.

17 A This is true.

18 Q And then furthermore, referring to the same sketch,  
19 if one then introduces the general behavior of the flood tide,  
20 one would see an upward moving velocity at the surface,  
21 which would be the maximum velocity in the flood profile,  
22 but this flood velocity profile, as one moves down vertically  
23 through the water column, will increase to some extent,  
24 and then eventually has to drop off to zero when it reaches  
25 the bottom. Do you agree?

ar7

1           A     Yes.

2           Q     And these arrows that are being drawn in reflect  
3     the relative magnitude of the longitudinal tidal velocities.  
4     Now when one then averages this effect at each point in the  
5     vertical profile over the entire tidal cycle, a new velocity  
6     profile will be obtained which, starting at the surface, is  
7     directed seaward, but drops off rather rapidly as one moves  
8     down into the water column, and then at approximately mid-  
9     depth begins to move in the upstream dimension, thusly. Would  
10    you agree, Dr. Goodyear, that this is a reasonable representa-  
11    tion of the average tidal motion or the average motion when  
12    averaged over the tidal cycle?

13          A     In a region which has a density-induced flow, this  
14    would be true.

15          Q     Right. It is this profile that generates the  
16    density-induced flow, or that may be called the density-  
17    induced flow?

18          A     Yes.

19          Q     And the sum total of the flow as characterized  
20    in this upper layer moving downstream would simply be shown  
21    as a single arrow and all seaward-directed upper layer flow,  
22    and similarly the velocity profile in the lower layer directed  
23    upward would be accumulated into a single landward-directed  
24    lower layer flow.

25          A     Is that a question?

ar8

1           Q     No, my question is do you not agree that this  
2 characterization represents the upper layer and lower layer  
3 flows introduced in your model?

4           A     Yes.

5           Q     Thank you.

6                   MR. BRIGGS: Could we interrupt this just for a  
7 minute for a minor question?

8                   On your averaging, did you intend to bring that  
9 back to zero at the bottom or not?

10                  DR. LAWLER: Yes, Mr. Briggs, that should go back  
11 to zero at the bottom.

12                  BY DR. LAWLER:

13                  Q     Now this, then, would characterize the hydraulics  
14 of the river in real time, and then in a time regime that  
15 represents behavior over a tidal cycle, would you not agree?

16                  A     I think everything that you have presented really  
17 has to be looked at as an average condition, rather than  
18 characteristic of a total period. In other words, the ebb  
19 condition and the flood conditions which you have drawn would  
20 represent certain situations, and it would not necessarily be  
21 the same all of the way across the river, for instance.

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1 Q Let me characterize it this way, Dr. Goodyear.

2 The sketch I have shown on the blackboard designated ebb and  
3 flood is simply a schematic that can represent the actual  
4 tidal behavior at any point throughout the tidal cycle, or  
5 the sketch designated "ebb" shows the behavior at any point  
6 throughout the ebb tide, although the relative magnitudes  
7 may be different.

8 And similarly, the sketch that I have shown  
9 represents again schematically or relatively, the behavior  
10 at any point across the river's cross-section.

11 A But for the purposes we are using it here, yes.

12 Q I am simply trying to establish, Dr. Goodyear,  
13 that the diagrammatic sketches here describing tidal behavior  
14 represent the way in which the tide behaves in the real  
15 world, if one goes out and looks at the river or makes measure-  
16 ments in the river, these are the kinds of things you will  
17 see. Is that correct?

18 A Well, the problem I am having is they are very  
19 simplified diagrams. There is a possibility of violating  
20 this diagram around the turn of the tide, at the time the tide  
21 turns. The actual flow relationship at that time can have  
22 the two layers, or the surface water and the water near the  
23 bottom moving in opposite directions.

24 Q That is certainly correct.

25 A But in general I would agree with you.

2mil

1           Q     Would you not also agree that the way in which one  
2 can obtain estimates of these upper and lower layer flows --  
3 provided one has sufficient information -- is to take present  
4 files of the actual tidal velocities and integrate them over  
5 the tidal cycle and one will end up with a result that looks  
6 like the right-hand diagram that I have drawn here on the  
7 board?

8           A     Yes.

9           Q     So that, then, characterizes where the hydraulics  
10 or the flows in your model originate?

11          A     Yes.

12          MR. KARMAN: Mr. Chairman, could we have just one  
13 minute's recess? I would like to consult with the witness  
14 for a moment.

15          CHAIRMAN JENSCH: Yes.

16          (Pause.)

17          BY DR. LAWLER:

18          Q     I would like to turn now to the introduction of  
19 the behavior of the larval organisms which again is another  
20 element of your model. It is my understanding that concept-  
21 ually or physically -- we haven't gotten to how this is  
22 translated into mathematical terms yet -- but conceptually  
23 you recognize the existence, let us say, of the larval  
24 organism in the upper layer as being there more probably in  
25 the evening hours than in the daytime hours. And while in the

3mil 1 upper layer, this larval organism is subject to the convective  
2 or horizontal motion of the estuary which in the upper layer,  
3 as characterized by yourself, it is moving downstream,  
4 because it is carried by the seaward directed upper layer  
5 flow. Is that not correct?

6 A That is true.

7 Q And then in the daylight hours, when daylight is  
8 first reached, there is a relatively rapid tendency for many  
9 of the larval organisms to move downward in the water column  
10 at which point our organism could now be characterized as  
11 residing or existing in the lower layer. Is that correct?

12 A It is not exactly correct. The two time periods  
13 are associated with a proportional difference in the  
14 concentration in the upper layer and lower layer. It is not  
15 the fact that all of the individuals within it, in a particular  
16 zone actually move from one layer to another. So that the  
17 change that occurs is a change in proportion, rather than  
18 total -- in other words, there will always be some in the upper  
19 layer moving downstream and always be some in the lower layer  
20 moving upstream..

21 Q I didn't suggest that this was true for all of them.  
22 But in general -- we are talking conceptually now -- my under-  
23 standing of your description of larval vertical migration,  
24 is that during certain periods of the 24-hour day those  
25 organisms would tend to be resident in the lower reaches of

1       the water column and that period would be daylight hours,  
2       and during the evening hours those organisms would tend,  
3       at least some of them, to rise up into the surface column.

4           A      Yes.

5           Q      Fine. Now the organism -- it is daytime now and  
6       we drop our typical organism into the lower layer. And that  
7       organism now becomes subject to the flow in the lower layer,  
8       which then tends to move the organism upstream. Is that not  
9       correct?

10          A      Again it is the same problem. In general your  
11       description is correct.

12          Q      I have no numbers on this at all.

13          A      No, it is just important to recognize that the  
14       entire population is not going through this type of a pattern  
15       simultaneously. For instance, organisms that are in the  
16       vertical water column in layers, say in the shoal area, where  
17       the lower layers is in deeper water, those organisms that  
18       are associated with the shoal may move from the surface to the  
19       bottom, but don't move from the surface layer to the lower  
20       layer. So it is really, you can't characterize everything as  
21       following this pattern. But a proportion of them do.

22          Q      Are you suggesting in the shoal area there is no  
23       such movement as described here?

24          A      What I am saying is that the movements pattern  
25       of the fish is the same, but the exposure, let us say, to upper

5mil

1 and lower layer -- well, it is based primarily on the fact  
2 that they would have to have -- well, for example, at Indian  
3 Point those fish on the far side of the river, away from  
4 Indian Point, are exposed to a shallow area, which should be  
5 in the upper layer flow during these periods when the flow is  
6 actually developed in that region. Now the point I am  
7 trying to get at is when a fish moves from the surface to the  
8 bottom in that area, he never moves into the lower layer flow.  
9 Whereas one in the middle of the channel, for instance, would.  
10 So that what you get for a net effect is the distribution  
11 of organisms which interacts with the flow. The organisms  
12 aren't moving from the upper to the lower layer, they are mov-  
13 ing from the surface to the bottom.

14 Q And my question to you a moment ago was with  
15 respect to the shoal area, and with respect to the hydraulics  
16 of the situation, and not concerned for the moment with the  
17 vertical movements of the organism. Are you suggesting  
18 that the movements in the shoal area is only one way, once  
19 we integrate out the tidal effect?

20 A Well, in certain areas. It depends on the actual  
21 physical features of the river at that point. At Indian  
22 Point, for instance, say for instance, for example, the upper  
23 layer is 20 foot in depth, and the shoal, the shallows you  
24 are looking at, considering them in particular, are eight foot  
25 in depth. Then the upstream movement portion would not exist on

6mil

1 that shoal at that point. And there would be a proportion  
2 of the population which would be on, or would be exposed  
3 to the upper layer and be exposed to the shallow water.

4 Q All right. We will go on. I understand what  
5 you are saying. I don't think you answered my question,  
6 which was from a conceptual standpoint, does this pattern of  
7 the organism over a 24-hour period that I have described,  
8 generally suggest the pattern you believe the organisms  
9 to be subjected to in the estuary?

10 A Yes.

11 Q Now --

12 CHAIRMAN JENSCH: To follow that up, your specific  
13 question is does it also apply in the shallow areas? Does  
14 the same pattern apply in shallow areas?

15 THE WITNESS: The pattern -- the answer is no.  
16 But the overall -- you are looking at a whole population,  
17 and the model is looking at the whole population. But the  
18 distribution of the organisms, the way they interact with  
19 the local environment dictates the degree to which they  
20 follow thie regime. And that is the point I wanted to make  
21 clear, that not all of the organisms over time are going  
22 through this particular pattern. But some portion of them  
23 do. And it provides a sort of an average, time averaged  
24 concentration gradient that results from vertical movements.  
25 In essence, the diagram that he has drawn is the reason that

7mil 1 the concentrations tend to stay fairly high in the upper ends  
2 of the saline intruded region. And it is the reason I  
3 answered yes to his question.

4 CHAIRMAN JENSCH: Thank you.

5 Proceed, please.

6 DR. LAWLER: I might say, Mr. Chairman, that the  
7 objective of this whole discussion is simply to see how much  
8 -- in any of these models, you can never model everything;  
9 that is the whole problem. What you try to do is model those  
10 things which you consider to be important. I am simply  
11 trying to bring out -- I want to make sure that our concepts  
12 of how this model operates are the same.

13 CHAIRMAN JENSCH: Proceed.

14 BY DR. LAWLER:

15 Q Now I would ask you whether or not you agree with  
16 the following statements. The first reference to -- well,  
17 this quantitative model presented in Appendix V-2 is a  
18 simplification of the real time process which we have just  
19 been discussing, both the hydraulics in real time, as well  
20 as the motion, the vertical motion of the organism. Would  
21 you agree with that statement?

22 A I am having a little trouble with the real time.  
23 It is the time averaged?

24 Q Yes. By real time I mean when you look at the  
25 actual physical phenomena, you stand on the bridge or the wharf

8mil 1 or what-have-you, this is not what you, the observer, see.  
2 This is what you see if you mind's eye can assimilate  
3 this whole thing over a 24-hour period.

4 A Yes.

5 Q That is your average. But real time describes  
6 the actual physical processes that are taking place in time  
7 throughout that 24-hour period.

8 A Well, the answer to your question was yes.

9 MR. TROSTEN: Dr. Lawler, I believe you referred  
10 to Appendix V-2. You meant to refer to V-3, didn't you?

11 DR. LAWLER: Yes. Throughout this discussion,  
12 I am talking about the model in V-3. I am sorry.

13 CHAIRMAN JENSCH: Do you want that before you, Mr.  
14 Witness?

15 THE WITNESS: Yes, it would be useful.

16 MR. KARMAN: This is the one on page V-29.

17 THE WITNESS: Just a moment ago when I answered  
18 the question, I was referring to V-2 rather than V-3. The  
19 answer would be the same. Yes.

20 MR. TROSTEN: You are talking about V-3 throughout,  
21 Dr. Lawler?

22 DR. LAWLER: I am talking about V-3 throughout  
23 this entire conversation.

24 BY DR. LAWLER:

25 Q Now specifically, so we are perfectly clear on this,

9mil

1 the tidal hydraulics in your model have been eliminated and  
2 replaced by net circulation, which is described as an upper  
3 and lower layer flor?

4 A Yes.

5 Q And the time variable diurnal migration does not  
6 appear as such in your model, but rather the average traction  
7 of the organisms appearing in the upper layer over a 24-hour  
8 period is assigned as the upper layer concentration, and  
9 similarly the average fraction of organisms appearing in  
10 the lower layer over the same 24-hour period is assigned as  
11 the lower layer concentration. Do you agree with that  
12 statement?

13 A The average concentration. Actually it is the  
14 average deviation from the average -- the compartmentalized  
15 concentration. It is not the average fraction per se.

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1 Q Well, let me -- in your particular model, in the  
2 upper layer you describe the fraction of organisms that you  
3 consider to be residing in the upper layer when averaged over  
4 a 24-hour period?

5 A That doesn't really characterize what I was doing;  
6 within any segment of the river there is an average concentra-  
7 tion which would be an average for all, in essence all of  
8 the organisms divided by the volume. The numbers which were  
9 used in the model and the fraction in the upper layer  
10 represent the deviation from the average concentration both  
11 in the upper and lower layer. In other words, the deviation,  
12 if you consider the upper layer has the smaller average number  
13 of organisms in it than the lower layer does, the average  
14 concentration would be less than, or the concentration in  
15 the upper layer would be less than the average concentration.  
16 It doesn't necessarily have anything to do with the fraction  
17 of organisms in the upper layer.

18 Q Would you say that if in a particular segment,  
19 in a particular run, the average concentration in the upper  
20 layer is less than the average concentration in the entire  
21 segment, would you then also say, for that case, that the  
22 average concentration in the lower layer is larger than the  
23 average concentration in the entire segment?

24 A Yes.

25 MR. BRIGGS: Excuse me; one question here. Is that

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1 average concentration the multiplier you use for the upper  
2 layer over the average for the whole thing in a 24-hour  
3 number, a one-hour number?

4 THE WITNESS: It is a 24-hour number.

5 MR. BRIGGS: Thank you.

6 BY DR. LAWLER:

7 Q I got a little ahead of myself in the discussion  
8 of the averages. I simply at this point want to determine  
9 whether or not you agree that the actual vertical diurnal time  
10 variable motion of the organisms does not appear in your model,  
11 but rather this has been replaced by the averaging concept  
12 that we just discussed?

13 A Yes.

14 Q Thank you. Now the next step you take -- I am  
15 going to erase this arrow that says "to ocean" here, so I can  
16 draw another sketch. The next step you take is to divide the  
17 estuary into a large number of segments and assign upper and  
18 lower layer flows and upper and lower concentration distribu-  
19 tions. Is that not correct?

20 A This is correct.

21 Q And then you go on from there -- I can sketch  
22 this (drawing on board). This would involve splitting the  
23 estuary up into a series of segments, which segments you can  
24 arbitrarily designate as "N", and the segment upstream  
25 would be designated as N minus one and the segment downstream

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1 would be designated as  $C_N$  plus one and so on. And in  
2 applying your flows, you again describe the difference  
3 between the upper layer and the lower layer. And entering  
4 the segment in the upper layer from the upstream direction  
5 you have a flow, and leaving the segment from the downstream  
6 direction you have a flow. And in the lower layer you enter  
7 the segment from the downstream direction, with a lower layer  
8 flow, and you leave that segment on the upstream end with  
9 this lower layer flow. And you assign numerical values to  
10 each of the flows, which numerical values are associated  
11 with a particular condition of fresh water flow, and salinity  
12 distribution in the estuary. Is that not correct?

13 A That is true.

14 Q And furthermore, you define a concentration  $C_N$   
15 and that concentration  $C_N$  represents the average concentration  
16 of organisms over the entire segment and as far as the move-  
17 ment of organisms is concerned, you assign an upper layer  
18 percentage and a lower layer percentage, so you can move these  
19 organisms with the upper layer flow and with the lower layer  
20 flow.

21 A That is true.

22 Q Thank you. Now your next step is to take the  
23 equation continuity or the conservation of mass, and apply  
24 it to any arbitrary segment and consider flow-in, flow-out  
25 and the associated organisms movements and the changes that

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1 take place in time and also the decay of organisms due to  
2 natural mortality. And in one segment you locate the plant,  
3 and in that particular segment you also withdraw organisms.

4 Is that not correct?

5 A Essentially, yes.

6 DR. GEYER: May I ask a question, please?

7 Since the salt concentration in the upper layer  
8 increases in the downstream direction and -- in the upper  
9 layer -- and also decreases in the upstream direction in  
10 the lower layer, there must be a flow of salt water vertically  
11 in each of those segments. Is this accounted for in these  
12 models?

13 THE WITNESS: It is not in this particular model,  
14 since the larvae are considered to move independently of  
15 the water, at least in a vertical sense. They distribute  
16 themselves in a vertical pattern by behavioral means rather  
17 than strictly hydraulic.

18 DR. GEYER: But you do change the amounts of flow  
19 in these two layers?

20 THE WITNESS: Yes.

21 DR. LAWLER: Yes. The horizontal flow is changed  
22 from segment to segment.

23 BY DR. LAWLER:

24 Q Now I would ask Dr. Goodyear this question, following  
25 your question, Dr. Geyer: If you -- you have analyzed this

1 river or this model, Dr. Goodyear, by writing the mass  
2 balance over the entire segment, not simply the upper layer  
3 or the lower layer. My question to you is if you were to write  
4 the balance over just the upper layer, like so (drawing)  
5 and similarly a second balance over just the lower layer,  
6 where this line matches this line, would you not generate  
7 the flow that Dr. Geyer is referring to, namely, would you  
8 not show a convective motion of water from the lower layer out  
9 and into the upper layer?

10 A Yes.

11 Q Thank you. It doesn't appear explicitly, but it is in  
12 there. Secondly, in response to Dr. Geyer, aren't you saying  
13 that the organisms that you are dealing with, you consider  
14 them to be independent of the water-induced vertical motions,  
15 and to have their own vertical motion, so for that reason  
16 you don't appear to consider it necessary to explicitly con-  
17 cern yourself with this? Is that right?

18 A That is correct. The actual velocities that are  
19 involved in that vertical motion are very small.

20 Q Extremely small, that is true. Now once you do  
21 this, it seems to me that what your model actually does, is,  
22 if we split this up into again a series of segments, and let's  
23 say this is the plant, you end up with a motion that looks  
24 something like this, where you have your seaward-directed  
25 upper layer flow, and you have the landward-directed lower

1 flow, and as far as motion or movements of your organisms  
2 are concerned, you have something that in the upper reaches  
3 of the salinity-intruded section of the estuary, you are  
4 continually bringing organisms up from the lower layer into  
5 the upper layer, in this fashion, not by water convection,  
6 but by their own motion, and in the lower reaches of the  
7 salinity-intruded section of the estuary you are bringing  
8 those organisms back down in the lower layer. Would you agree  
9 that this in general describes what physically takes place  
10 in your model when it is all put together?

11 A The net effect would be what you have depicted.  
12 I should point out that the actual movement that is built  
13 into the model does not have a different component for the  
14 downstream sectors, it is the same component. The overall  
15 process of the model does give you a net effect similar to  
16 what you have depicted. But there is downward vertical  
17 movement from the upper layer into the lower layer from each  
18 of the segments. In other words, you have drawn a net picture  
19 rather than a gross one.

20 Q Are you suggesting that in the upstream segments  
21 there, as well as being a vertical upward-directed motion,  
22 there is a vertical downward-directed motion?

23 A Yes.

24 Q Does that motion occur within the 24-hour period  
25 that you are describing as the period over which the

1 averaging process has taken place?

2 A Yes.

3 Q Have you computed these motions in both the  
4 upstream and the downstream -- both the up movements and  
5 the down movements?

6 A Well, the way the model is constructed, one  
7 implicit factor is the concentration within a particular  
8 segment is considered -- yes, the concentration in a particu-  
9 lar segment is considered to be completely mixed. In other  
10 words, all of the organisms in that sector distribute them-  
11 selves in a manner which is consistent with the distribution  
12 that was used to derive the average concentration in the  
13 upper and lower layers. What I am saying is that when the  
14 material balance is constructed, the concentration in the  
15 next compartment is considered to be completely mixed, the  
16 material is completely mixed. If what you were saying is  
17 true, in your diagram, the upstream segment just downstream  
18 from the last salinity-intruded zone, going up the upstream  
19 direction --

20 Q Right here? Say -- you mean you are working from  
21 the upstream, all right. Which segment?

22 A The one, put one up there for a, a fresh one,  
23 completely fresh water, no salinity intrusion.

24 Q (Drawing.)

25 A Right. Now the second segment beyond that should

1 not get any, say, larvae into it, the bottom part of it,  
2 it should not have any larvae put into it until fairly  
3 late after the model is started. But that whole section is  
4 considered to be completely mixed with a deviation in concen-  
5 trations vertically that are susceptible to the flows.

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1 Q I don't really think you have answered my question.  
2 You said a moment ago that there is an actual motion,  
3 transport of organisms in the units of organisms per day or per  
4 hour or per whatever time you wish to use, not only in the  
5 upward motion in these upper segments, but also downward.

6 A Yes.

7 Q And I asked you whether you had ever computed  
8 that motion you are describing exists.

9 A In what kind of units do you mean?

10 Q Well, the transport units are organisms per day or  
11 per whatever you want to use, lifted from one layer to the  
12 other.

13 A Not in those units, I have not calculated that.

14 Q Let me ask it this way. Have you ever computed,  
15 forgetting for the moment whether they go up or they go down  
16 in any given segment, have you ever computed the movements  
17 in the vertical direction from one layer to the sister,  
18 the other layer, in any given segment?

19 A Not as such, at least not in the model.

20 Q Let me ask you a question. A moment ago Dr. Geyer  
21 asked the question as to whether the vertical water transport  
22 could be computed or was in your model, and I think we both  
23 indicated that it wasn't explicitly, but it could be obtained  
24 by splitting the model up into an upper layer model and a lower  
25 layer model. Should you not be able to do the same thing, that

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1 is split this model into an upper layer model and an associated  
2 lower layer model, and then in doing that should you not  
3 be able to compute the movements across the interface of organisms?

4 A This could be done, yes.

5 Q Have you ever done it?

6 A Not for this model.

7 Q If you have never done it, how can you suggest that  
8 in an upstream segment of this nature, you can have, within  
9 the same 24-hour period, motion this way as well as this way.

10 CHAIRMAN JENSCH: That wasn't quite his answer. His  
11 answer was he hadn't done it for this model. So I infer he  
12 has done it for some other occasions and this background gave  
13 him the base for his opinion. It was your questions, "Since  
14 you have never done it." He has done it, I infer, but not  
15 for this model.

16 DR. LAWLER: I am referring to this model.

17 CHAIRMAN JENSCH: Yes.

18 BY DR. LAWLER:

19 Q Have you done it for any other model?

20 A From the data, yes.

21 Q I don't understand that response, from the data.

22 A One can compute, and I have done this, from the  
23 vertical distribution and the variation in the vertical  
24 distribution day and night, one can compute the degree to which  
25 organisms of striped bass in this case are moving from the

1 surface downward, from the lower layer in the upward direction.  
2 And you get both directions, for any one segment you would have  
3 both directions involved.

4 Q That is true, I certainly agree to that. The  
5 data certainly show that. My question is does your  
6 model do that?

7 A The model does it, but it doesn't do it explicitly.  
8 It does it because it assumes the total number of organisms  
9 in a river segment is distributed randomly throughout the  
10 segment, except for the transport between segments.

11 In other words, when the model, when the material  
12 balances is constructed between two compartments, the organisms  
13 which are added to the lower compartment or the upper compart-  
14 ment, whichever, are considered to be randomly distributed  
15 within the upper compartment. That in itself mixes the two,  
16 the upper and lower layer. Do you follow me?

17 MR. BRIGGS: Could I ask a question here that would  
18 help me, I don't know if it will help anyone else, but how  
19 do you determine what multiplier you are going to assign for the  
20 upper compartment and for the lower compartment of each segment,  
21 this multiplier being the multiplier of the average concentra-  
22 tion for the whole segment?

23 THE WITNESS: That multiplier was derived from the  
24 Carlson-McCann data, by taking the average concentration  
25 throughout the water column and comparing it to the average

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1 concentration in the upper layer, averaged over the day and  
2 night period. Now, there were several factors used to see what  
3 effect it would have on the actual prediction from the model.  
4 And it doesn't, as long as there is a larger concentration  
5 or larger factor in the lower layer than in the upper layer,  
6 the prediction is almost the same.

7 MR. BRIGGS: This means that as you go from one  
8 compartment to another compartment, there could be an upflow  
9 of organisms or a downflow, either one?

10 THE WITNESS: Yes.

11 CHAIRMAN JENSCH: Is this a convenient place --  
12 did you want to finish something?

13 DR. LAWLER: If I could just ask one or two more  
14 questions. Mr. Briggs has just suggested that in your model  
15 in any segment there could be an upflow or a downflow. My  
16 question to you is in any given 24-hour period, can you have  
17 both an upflow and a downflow?

18 THE WITNESS: Yes, you could, yes.

19 BY DR. LAWLER:

20 Q HAve you ever computed that? I suggest you can't  
21 but perhaps I shouldn't --

22 A Again, we are talking about the difference is one  
23 in terms of the net transport. Because you could have  
24 virtually all of the organisms moving within the two layers,  
25 and --

1 Q Dr. Goodyear, let me try --

2 CHAIRMAN JENSCH: I don't think he had finished.

3 Go ahead.

4 THE WITNESS: I am just having a problem understanding  
5 the point that you are getting at.

6 BY DR. LAWLER:

7 Q Let me describe the point. My only point is that  
8 as I understand it, your model effectively is using 24-hour  
9 averages. It does not have in it the wherewithal to track  
10 the motion of the larval organisms within the 24-hour period.

11 Is that correct?

12 A That is true.

13 Q All right. Then, I am suggesting, or I am secondly  
14 asking, you, do you not agree that there is, in your model,  
15 although it is not explicitly stated, an ability to compute  
16 the movement of organisms in any given segment across the mid-  
17 layer interface? I am suggesting that ability exists and you  
18 agree that ability exists.

19 A Yes.

20 Q I am also --

21 A The net movements.

22 Q Excuse me.

23 A The net movements.

24 Q It can only be net. You are doing it on a 24-hour  
25 base. You suggested a moment ago you don't have a wherewithal.

1 to do it within the 24-hour base.

2 DR. GEYER: I think the problem is the word net  
3 was left out of some of these statements. If you just ask if  
4 the organisms can move up and down in 24 hours, they can.

5 DR. LAWLER: But the model does not describe that  
6 movement in 24 hours.

7 THE WITNESS: No, it does not.

8 BY DR. LAWLER:

9 Q You do agree the net movements in the 24-hour period  
10 will either be upward or downward?

11 A Yes.

12 Q Now, my question is have you ever in this model  
13 computed that net movement? In each of the segments involved?

14 A That is really difficult to answer, because in  
15 checking the model out itself, there were many checks on this,  
16 and I don't recall off-hand whether I did or not.

17 Q To obtain this net movement, recognizing  
18 what is in your model in the overall viewpoint,  
19 would you not have to split the model into a separate upper layer  
20 and lower layer, and strike the balance over the lower layer,  
21 a similar balance over the upper layer, and recognize that  
22 the movement between the two layers was the same number?

23 A Conceptually, yes.

24 Q Well, let's go beyond conceptually. Can you suggest  
25 another way to compute this movement?

1           A     You can monitor the change -- it seems like I  
2 remember doing this, as a matter of fact. If you monitor  
3 the change in concentration of the number of organisms added  
4 and the number of organisms subtracted from the compartment,  
5 and you keep tabs on the relative proportions, in other  
6 words, all I am suggesting is if you have more organisms being  
7 transported downstream out of the compartment than are trans-  
8 ported upstream into the compartment, then you would have a net  
9 output which would be in a downstream direction and you can  
10 compute that value by knowing the input from the compartment  
11 above it.

12           Q     I think I would agree with that, I think you could.  
13 Have you done that?

14           A     I really can't answer you directly. I would  
15 have to look and see. I believe I have, in checking to see if  
16 the model itself wasn't making or reducing the number.

17           Q     Would you agree that it is possible that the  
18 characterization that I have described here on the board  
19 in the upper reaches of the saline-intruded section of the  
20 estuary, the net movements in the vertical direction will be  
21 from lower layer to upper layer, and in the downstream reaches  
22 of the saline-intruded section, that net movements will be  
23 from upper layer to lower layer?

24           A     Yes, that is what I said in the beginning.

25           Q     Well, I am sorry, if you did, I didn't understand you

1 to say it.

2 CHAIRMAN JENSCH: Is this a convenient place  
3 to interrupt your examination?

4 DR. LAWLER: I think so, Mr. Chairman.

5 CHAIRMAN JENSCH: I might mention the Board has  
6 been handed a note stating that the Federal Trade Commission  
7 employees have been dismissed today at 4 p.m.. We will inquire  
8 whether they expect us to leave at this time too. At this  
9 time we will recess, to reconvene in this room at 2:50.

10 14 (Recess.)  
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1 CHAIRMAN JENSCH: Please come to order. The informa-  
2 tion I have received from one of the commissioners' officers  
3 is that we must be out of this building at 4:00 o'clock  
4 today.

5 Is Dr. Lawler ready to resume?

6 DR. LAWLER: Thank you, Mr. Chairman.

7 MR. TROSTEN: Mr. Chairman, I guess we will just  
8 have to talk about what we will do at that time. I take it  
9 there is no other facility we can go to.

10 CHAIRMAN JENSCH: As I understand it, the Federal  
11 Buildings are expected to be cleared tomorrow at noon.

12 DR. LAWLER: I will try to move along as best I  
13 can.

14 CHAIRMAN JENSCH: If you feel this is a relevant  
15 inquiry, take the time you need. If we don't finish at this  
16 session, we will have to find time on another occasion. Pro-  
17 ceed.

18 BY DR. LAWLER:

19 Q I would like to refer back, Dr. Goodyear, to this  
20 last picture of the estuary that I have drawn, in which I have  
21 suggested that what your model does is to bring organisms  
22 in an upward direction motion, in a landward direction motion,  
23 along the bottom or lower layer of the estuary, and as you  
24 get into the more upstream segments of the saline-intruded  
25 reach, your organisms, on a net 24-hour basis, will be moved

2mil 1 into the upper layers. And similarly, as that is done,  
2 they will begin to move back downstream in those, in that  
3 seaward direction upward, or upper layer, past the plant,  
4 at which point they will be subject to entrainment, or at  
5 least a percentage of them will be subject to entrainment,  
6 and those that are not entrained and killed by the plant  
7 will continue on downstream. But when they go downstream,  
8 they will then move back into the lower layer, and follow  
9 the path I have just described again to a point upstream of  
10 the plant, back into the upper layer, move back past the plant.  
11 I suggest that the model will continue this oscillatory  
12 process for as long a period of time as a salt profile exists  
13 in the vicinity of the plant, and thus the organisms will be  
14 exposed to entrainment by the plant on many, many occasions.  
15 Do you agree?

16 A That is true.

17 Q Thank you. I think I can sit down now and continue.

18 Now, Dr. Goodyear, you have assigned a fixed  
19 split between the upper and lower layer concentrations for any  
20 given set of run conditions, and by run conditions, I mean a  
21 set of input conditions you put into the computer model in  
22 doing your evaluation?

23 A Yes.

24 Q Now do you think that this will determine, this  
25 fixed split, will determine the total upward or downward

3mil 1 vertical translation of organisms in each segment?

2 A Yes.

3 Q I think you have answered yes to this, but will  
4 not this approach for a given set of flows force the net  
5 movement in a given segment to be either up or down, but not  
6 both?

7 A The net movement?

8 Q The net movement?

9 A Yes.

10 Q Do not the organisms in any segment move up at  
11 night and down during the day, in a general way?

12 A Yes.

13 Q Now, are not the sets of migration splits that  
14 you have chosen as shown on page A-5-87 -- these are the  
15 choice of migration factors that you list in a footnote  
16 on that table -- are these not the result of a statistical  
17 evaluation in which concentration values only were used in  
18 evaluating the vertical behavior of the organisms?

19 A Would you repeat that?

20 Q I am asking -- you computed, I think, the migration  
21 preferences, I think you called them, migration factors,  
22 and I have the impression from your response to Mr. Briggs a  
23 few moments ago, that these were obtained by evaluation of  
24 data in order to give you a reasonable idea of the average  
25 concentration that existed in the upper layer and the average

4mil 1 concentration that existed in the lower layer over a 24-hour  
2 period.

3 A Are you asking me are all of these pairs --

4 Q I am asking you whether your evaluation or your  
5 determination of migration factors is obtained by a statistical  
6 analysis, in which you are not dealing with flows, but you  
7 are dealing with concentrations? In other words, you are  
8 not dealing with transportation, but you are dealing with  
9 concentrations?

10 A The evaluation is, yes. However, these numbers  
11 that appear in this table which were selected for evaluation  
12 with the model are arbitrary values which represent a range  
13 of conditions. The condition which -- there was another  
14 condition, by the way, which was examined, that being an  
15 upstream factor of 1.25 and 0.75. The most reasonable value,  
16 which was the one that came out very close to the computed value  
17 from the data was the .67 by .33. It made problems in  
18 evaluating the data, because there is no good method to  
19 segment the river vertically into the various layers.

20 Q Is it not true that in making a given run in  
21 the model you used for the saline intruded section the same  
22 migration split in all segments or compartments?

23 A Yes.

24 Q Does it seem reasonable to you that the same split  
25 should apply to all segments when in fact your model over any

5 mil 1 24-hour period will yield a net vertical downward movement in  
2 some segments -- as we described a moment ago -- and a net  
3 vertical upward movement in other segments?

4 A Yes.

5 Q It does?

6 A Yes.

7 Q It is logical to you that the split should be the  
8 same for all segments, even though the vertical transportation  
9 may be in one direction over a 24-hour period, which these  
10 splits refer to now, in one segment, and in the opposite  
11 direction in another segment?

12 A Yes.

13 Q Would you not think that a better approach in  
14 evaluating this phenomena would have been to induce the known  
15 time variable behavior of the migrating organism into the  
16 model?

17 A Yes.

18 Q Might this not give a substantially different  
19 result than the results you have reported?

20 A I doubt it. It would be different, but the  
21 degree of difference should not be too great.

22 Q But you don't know whether or not it would be?

23 A Not without some additional thought.

24 Q Not without some additional --

25 A Thought.

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1           Q     Now do you believe that the tidal motion in an  
2 estuary induces longitudinal and vertical mixing of the water?

3           A     Yes.

4           Q     Do you believe that the smaller value organisms  
5 will be subject to such longitudinal mixing?

6           A     Yes.

7           Q     Do you believe they will be subject to vertical  
8 mixing?

9           A     Yes.

10          Q     Have you induced the tidal exchange or vertical  
11 tidal mixing into the model?

12          A     Not explicitly.

13          Q     Have you induced it in any other way, other than  
14 explicitly?

15          A     In essence the consideration of the compartments  
16 completely mixed, for the type of model that is presented, any  
17 tidal induced mixing within a compartment would not affect  
18 the concentration within the compartment anywhere.

19          Q     How about tidal induced mixing between compartments?

20          A     That would have some effect, but again the compart-  
21 ments that are depicted in the way the model is built, the  
22 compartments are volume related, the boundaries of the compart-  
23 ment are not fixed points on the river. In other words, the  
24 boundary for the -- the lower boundary for the compartment  
25 at Indian Point would fluctuate from a point at Indian Point to

7mil 1 downstream one tidal excursion. Do you understand?

2 Q Does your model have incorporated in it the fluctuating boundary behavior you just described?

3 A The model itself, the way it is constructed, that  
4 is what it would be reflecting. Rather than -- it is not  
5 explicit in the model, but the framework for the model is  
6 built on that basis and the assumptions are built on that  
7 basis.

8 Q My question to you still would be can you tell me  
9 where the notion of tidal exchange in the longitudinal dimension  
10 or between segments appears in your model either explicitly or  
11 implicitly?

12 CHAIRMAN JENSCH: I think he said it is not  
13 explicit. So you are not asking him to tell you that again.  
14 Now are you asking him implicitly?

15 DR. LAWLER: Yes.

16 CHAIRMAN JENSCH: He just stated the framework is  
17 built on it and the assumption is included. Is there something  
18 further you can add?

19 THE WITNESS: Well, the concept of tidal mixing  
20 between compartments -- I am really not sure how to explain  
21 this. By having the compartment volumes determine the  
22 boundaries, instead of the boundaries of the river set up to  
23 determine the compartment volumes, you reduce a lot of the  
24 errors that can be induced from many sources of transportation,

8mil 1 such as you are speaking of now.

2 BY DR. LAWLER:

3 Q Are you suggesting to me --

4 CHAIRMAN JENSCH: Wait a minute. He hasn't  
5 finished yet.

6 THE WITNESS: One would have to -- in reality,  
7 what it comes down to is any compartmental model which is set  
8 up the way this one is set up does not have, if you were to  
9 put it on the river and look at it as a real entity, and try  
10 to compare it as a real entity to the river, the compartment  
11 itself would be moving upstream and downstream with the tide,  
12 rather than the compartment being fixed in the river and having  
13 the tidal excursion moving through it.

14 BY DR. LAWLER:

15 Q You are suggesting to me, I think, if I understood  
16 you correctly, that in your model there is a term or a  
17 computational procedure which makes the boundary of each  
18 segment move with the tide. Is that correct?

19 A You are misinterpreting what I am saying. The  
20 fact that there is no term for the tidal effect makes the  
21 compartment move upstream and downstream. The compartment is  
22 the water. It is not -- since we are working with concentra-  
23 tions in particular, the compartment is really the volume of  
24 water which has an average position at a given point in the  
25 river.

9mil 1 Q The only way I can possibly interpret the statement  
2 you have just made is that the compartment is moving.

3 MR. KARMAN: Dr. Lawler, Dr. Goodyear has  
4 answered the question, if you have a further question, rather  
5 than argue back and forth, why don't you propound a question  
6 rather than debate with him?

7 BY DR. LAWLER:

8 Q Is that correct, Dr. Goodyear?

9 A I think the problem is one in interpreting what  
10 the model is producing, not what the model has as input and  
11 the computational procedure. If you are to interpret the  
12 model strictly the way it is fabricated, then if you induce  
13 it, if you look at the tidal effect on top of the model, the  
14 volume, the whole river volume moves.

15 Q The river volume moves through each compartment,  
16 is that what you mean?

17 A No. Forget for a minute that the compartments  
18 are associated with certain sections of the river. The  
19 compartments in this particular situation are envisioned as  
20 volumes of water connected end on end with transport mechanisms  
21 working between them. Now that series of volumes is the  
22 conceptual framework around which the factors are solved. In  
23 other words, that is what the computational procedure is all  
24 associated with, that volume, not with anything associated  
25 with the river. Now those volumes, that serial gathering

10mil

1 of volumes, if you will, when inserted in the river in the  
2 proposition, have an average -- if you let them be in the  
3 river and have the tide work on them -- each volume would have  
4 an average position.

5 Q You said a moment ago that you envision the volumes  
6 as -- you didn't use the word connected, but you said they  
7 are located end on end, and then the transport is constructed  
8 or fabricated to take place between each segment. Is that  
9 correct?

10 A Right.

11 Q Now that transport you just referred to, is that  
12 transport a tidal mixing, a tidal exchange?

13 A No. That is what I said in the beginning, there is  
14 an error induced by the fact that the tidal mixing is not  
15 a part of the exchange. However, because of the way one  
16 interprets the model, should interpret the model, the tidal  
17 mixing effect is not as significant as it could be.

18 Q Is the longitudinal tidal mixing effect accounted  
19 for in this model?

20 A As I said before, not explicitly.

21 Q Dr. Goodyear, if you say not explicitly, you imply  
22 implicitly. Is it implicitly?

23 A To a degree.

24 Q How?

25 A Simply because the mixing -- tidal mixing which

11mil 1 occurs within the compartment does not affect the concentra-  
2 tion, because of the way the model is fabricated. There is  
3 no term for accommodating tidal mixing between the compart-  
4 ments.

5 Q Fine.

6 A That is essentially what I said in the very  
7 beginning.

8 Q Then let me rephrase my statement. By tidal  
9 exchange or longitudinal mixing, as applied to the model  
10 we have discussed here today, I will define what I mean by  
11 that is transport due to tidal mixing between segments.  
12 Now I suggest that no such term exists in your model. I will  
13 ask you, do you agree?

14 CHAIRMAN JENSCH: I think you are setting up a  
15 straw man and want him to knock it down. He doesn't accept  
16 the premise, the kind of transport to which you refer. I think  
17 he has said explicitly it is not in there, but implicitly  
18 there is a transport consideration. Is that correct?

19 THE WITNESS: Only within the segment. Between  
20 segments there is no accommodation for that type of an  
21 exchange.

22 DR. GEYER: What kind of exchange is accounted  
23 for between the consecutive segments?

24 THE WITNESS: The exchange which is caused by the  
25 convective transport. In other words, this is the upper layer

12mil

1 flow, the lower layer flow, and in regions which are not saline,  
2 intruded by saline water, the fresh water flow itself.

3 DR. LAWLER: Excuse me.

4 CHAIRMAN JENSCH: While you are conferring for a  
5 moment, let me check on space again and I will try to come back  
6 in about two minutes.

7 (Pause.)

8 CHAIRMAN JENSCH: Have you completed your  
9 conference, Dr. Lawler?

10 DR. LAWLER: Yes, sir.

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1 CHAIRMAN JENSCH: Proceed.

2 BY DR. LAWLER:

3 Q Dr. Goodyear, would you consider your model to  
4 be basically a one dimensional estuarine transport model?

5 A Basically.

6 Q Do you not agree that most one dimensional estuarine  
7 models treat the influence of the tide on longitudinal mixing in  
8 one fashion or another?

9 A Yes.

10 Q Do you have any idea what the effect of longitudinal  
11 mixing or longitudinal exchange would have on your model, if  
12 you did introduce it?13 MR. MACBETH: Two questions in one. Could we  
14 split them in half? Tidal exchange and longitudinal?

15 BY DR. LAWLER:

16 Q It is the same thing.

17 A What effect would it have?

18 Q I am asking you if you have any idea of what effect  
19 it would have on your model?

20 A On the predictions?

21 Q All right, on the predictions from the model.

22 A It should not have too great an effect in so  
23 long as the convective transports are much more important  
24 than the tidal mixing.

25 Q Will the effect tend to increase or to decrease

ar2

1 the predictions of percentage reduction of striped bass that  
2 you would get?

3 A That would depend completely upon which situation  
4 was being modeled. In some cases it would cause increases,  
5 in some cases it would cause decreases.

6 Q Could you suggest a case where it would cause an  
7 increase?

8 A It would cause an increase at any point where the  
9 salt front were downstream from Indian Point. It would  
10 decrease it -- I can't come up offhand with a good example  
11 of that. But it would depend upon the position of maximum  
12 concentration of organisms as predicted by the model now,  
13 versus what it would be.

14 Q Would not it effectively introduce a longer path  
15 for the oscillatory motion we have described that the  
16 organisms travel between passes past the plant?

17 A It would, yes, but the degree to which it would  
18 again would be a function of the relation to the convective  
19 flows.

20 Q Would that not reduce the number of exposures of  
21 each organism during the period of vulnerability?

22 A Yes. It would also increase the rate of movement  
23 downstream from upstream compartments as well, which  
24 effectively could increase the number which get exposed in  
25 the first place. I suspect that it would be an offsetting

ar3

1 mechanism. Just as changing the migration factors that are  
2 applied, that in itself changes the distribution along -- it  
3 affects the distribution and the number of exposures. But  
4 by increasing the length of time between exposures, as you  
5 expressed it, the same factor increases the number of  
6 organisms which are potentially exposed. Thus what you have  
7 is a smaller effect on the downstream segments, but the  
8 total reduction comes out about the same.

9 Q Wouldn't it be a relatively simple matter to  
10 introduce tidal oscillation or longitudinal tidal exchange,  
11 again the same thing, into your model?

12 A It could be done, but again it would have to be  
13 done with some understanding of the relative concentration of  
14 organisms within that water which is transferred from  
15 compartment to compartment. And that component may be more  
16 difficult to ascertain with any validity.

17 Q Are you saying --

18 CHAIRMAN JENSCH: Wait a minute. I don't think  
19 he had finished.

20 THE WITNESS: To ascertain with any validity. It  
21 would be introducing another arbitrary set of conditions  
22 which are effectively -- the objections you have raised are  
23 effectively covered by increasing the migration factors which  
24 are applied within this presentation. In other words, if  
25 you transfer things faster, just from letting a higher

ar4

1 fraction be exposed to the downstream transport. In the  
2 upper layer, you effectively do what you are talking about,  
3 you increase the length of time between exposures, because  
4 you are transporting them downstream much faster than you  
5 would be with a lower migration factor for the upper layers.

6 BY DR. LAWLER:

7 Q Dr. Goodyear, do we not have reasonably good  
8 estimates of the behavior of the tide and associated mixing  
9 in the Hudson River?

10 A Yes.

11 Q Do you believe -- if I understood your prior answer  
12 before this last answer correctly, you are saying that you  
13 believe that the effect that I am suggesting should have been  
14 taken into account can be equally well handled by using  
15 different migration coefficients? Did I understand you  
16 correctly to say that?

17 A In essence.

18 Q Now did I also not understand you correctly to  
19 say that you don't really know what the proper migration  
20 factors to use are?

21 A That is correct.

22 Q And you think that an equally good way of treating  
23 tidal motion, which really has nothing to do -- strike that.

24 An equally good way of treating tidal motion  
25 by comparison to introducing it explicitly into the model is

ar5

1 to handle it through the migration factors?

2 A This doesn't handle the tidal motion, but it  
3 gives you some feel for the sensitivity of the prediction to  
4 any number of different assumptions concerning the mixing  
5 between the compartments, because in essence the migration  
6 factors are the factors which determine the degree of mixing  
7 between the compartments.

8 Q But not between compartments? I said but your  
9 migration factors do not describe the degree of mixing between  
10 compartments. Is that not correct? I am talking about mixing  
11 between compartments.

12 A Right, they do, yes.

13 Q Are you telling me that the choice of constant  
14 migration factors for any given run, for all segments within  
15 the salinity-intruded reach, is a satisfactory manner of  
16 evaluating the mixing that takes place between segments?

17 A Would you repeat that, please?

18 (The reporter read the pending question.)

19 THE WITNESS: It is a method of evaluating the  
20 importance of various assumptions concerning mixing between  
21 compartments. The mixing between compartments in this model  
22 can be varied by a factor of two or three or four without  
23 influencing the prediction to any great extent, and it has  
24 been done.

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ar6

1 BY DR. LAWLER:

2 Q I don't understand how -- strike that, please.

3 I would ask you how you have evaluated the actual  
4 mixing, net transport between segments that takes place via  
5 tidal exchange in our model to allow you to say that you  
6 can have a change in the mixing of two or three or four times,  
7 and if I have paraphrased your answer correctly, it doesn't  
8 have much influence on the result?

9 A The point that I was addressing was that the  
10 exchange between the compartments, which is accommodated by  
11 the convective flows through the compartments, and in conjunc-  
12 tion with these migration values, can be altered by a factor  
13 of three or four and the actual number of organisms transported  
14 can be varied a great deal without changing the ultimate  
15 prediction. It alters the output from the run compared to  
16 the alternative by some percentage, but it is not a great deal.

17 Q Dr. Goodyear, do you think that rather than  
18 averaging upper and lower layer flows and larval vertical  
19 movements over a 24-hour period, as we have discussed earlier,  
20 that averaging over a three-hour period would be a more  
21 accurate representation of the system you have described?

22 Let me add to that, I would add to that by  
23 introducing an average over a three-hour period, I would also  
24 propose introducing into the model the actual vertical time-  
25 dependent transport that takes place in the organism and its

ar7

1 actual horizontal time-dependent transport that takes place  
2 due to the tide?

3 A What was the question itself?

4 Q My question is that were I to introduce those two  
5 time-dependent mechanisms explicitly, and evaluate in terms  
6 of a three-hour average, or one hour, for that matter, but  
7 let's just take the three-hour average, would you not agree that  
8 this would give a more accurate representation of the  
9 physical system we are trying to describe?

10 A It would, of the physical system, yes.

11 Q And biological system?

12 A Only if the data you use are sufficiently precise.

13 Q Would you agree that this procedure as I have  
14 described, the introduction of the time-dependent mechanisms  
15 and the three-hour averaging technique, could result in  
16 translating the organisms at a lower rate?

17 A A slower rate?

18 Q Yes.

19 A Yes.

20 Q If the three-hour averaging technique translates  
21 organisms at a slower rate downstream and upstream than a  
22 24-hour averaging process would, would not the plant  
23 reduction, as reported by yourself over an eight-week -- or  
24 reported by the computations in your model, be less than  
25 the plant reduction for the 24-hour period? I think the

ar8

1 reporter better read that question back.

2 (The reporter read the pending question.)

3 DR. LAWLER: I would have to strike the last  
4 clause starting with the word "would." I will repeat the  
5 question.

6 BY DR. LAWLER:

7 Q If the three-hour averaging technique translates  
8 organisms at a slower rate downstream and upstream than a  
9 24-hour averaging process would, would not the plant reduc-  
10 tion, as computed via that "three-hour model" be less than  
11 the plant reduction computed with a similar set of conditions,  
12 but using the 24-hour model?

13 A Somewhat.

14 CHAIRMAN JENSCH: While there is a pause, we have  
15 just received information that we might not have our cut-  
16 off exactly at 4:00 o'clock. We can extend over a little  
17 while, I guess.

18 BY DR. LAWLER:

19 Q Dr. Goodyear, are you aware of the existence of  
20 the so-called equations of change or the differential  
21 equations which describe mass and momentum and energy transport  
22 in a fluid system?

23 A Am I aware of them?

24 Q Yes.

25 A Yes.

ar9

1           Q     Are you aware that these equations provide the  
2 general means of describing transport of heat and fluids  
3 and particles in any fluid system?

4           A     Yes.

5           Q     Are you aware that virtually all of the one and  
6 two dimensional steady time and time variable equations  
7 that are employed as models of river and estuarine behavior  
8 can be derived from these more generalized equations?

9           CHAIRMAN JENSCH: I wonder if I could have that  
10 question reread, please.

11                   (The reporter read the pending question.).

12           THE WITNESS: Yes.

13           BY DR. LAWLER:

14           Q     Are you aware that when this is done that new  
15 materials are introduced which are the net result of integrating  
16 out variable behavior in a given direction?

17           A     Yes.

18           Q     Are you aware that this procedure yields average  
19 concentrations and temperatures and values of whatever the  
20 dependent variable is you are dealing with, and in doing so,  
21 provides a means of relating such averages to the factors  
22 upon which they depend?

23           A     Yes.

24           Q     Have you considered using this approach in the  
25 development of your model?

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1           A     It has been considered.

2           Q     Can you describe to me the status of that approach?

3           A     It was not considered a reasonable methodology  
4 for this particular situation, simply because the data base  
5 is not sufficiently -- it was two things. The actual driving  
6 force that is used to make the model run is a -- excuse me.  
7 I am talking about another model.

8                 Let me put it this way: It has not been considered  
9 for this model itself. The value of more of the more  
10 sophisticated approach in terms of computer time alone was  
11 not considered to be worthwhile, and what I am saying is  
12 that the things important in this model are very gross in  
13 nature, in terms of our ability to define the specific values.  
14 And it was not considered by me and the people who were advising  
15 me to be worthwhile to program a model based on a more  
16 sophisticated set of equations. Just from the fact that  
17 the output values would have no more meaning.

18           Q     I would like to clarify the points of my question.

19                 I am not in any fashion suggesting that these types of  
20 equations be used or solved or programmed or what-have-you.  
21 I am simply suggesting or asking you whether you agree that  
22 the use of these equations following the integration process  
23 that I have suggested they can be put to, will provide you  
24 insight in the averaging processes that you are using in your  
more, in the grosser equations that you describe. That is

1 the only reason for my question.

2 A I would agree.

3 Q Has that been done?

4 A To a certain extent. I mean it has not been  
5 formally done.

6 Q It has not been formally done. Thank you.

7 CHAIRMAN JENSCH: While there is a pause, let me  
8 make another call.

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1 CHAIRMAN JENSCH: Do you have further interrogation,  
2 Dr. Lawler?

3 BY DR. LAWLER:

4 Q The line of questioning of the last hour was directed  
5 at the whole notion of the averaging process. I would like  
6 to turn to another line of questioning at this time.

7 CHAIRMAN JENSCH: My inquiry, if we went to 4:15, do  
8 you think you could complete the Applicant cross-examination?

9 MR. TROSTEN: By Dr. Lawler.

10 CHAIRMAN JENSCH: Or by you too.

11 MR. TROSTEN: I am afraid not.

12 CHAIRMAN JENSCH: That is one of the problems about  
13 the schedule. Proceed, Dr. Lawler.

14 MR. BRIGGS: Could I ask just one question that  
15 I would like to keep in mind as I go along. The Applicant  
16 provided us some information on the withdrawal of organisms  
17 from the river in the April 15 testimony. Was that information  
18 and the averaging used there based on all of these considera-  
19 tions you have been talking about here?

20 DR. LAWLER: The April 5 --

21 MR. BRIGGS: April 15 testimony. Or April 5, rather

22 DR. LAWLER: The April 5 model was a model that  
23 addressed itself to the entire volume of the river --

24 MR. BRIGGS: You mean it didn't divide the river  
25 up into segments.

1 DR. LAWLER: No, sir.

2 MR. BRIGGS: And it didn't consider the organisms  
3 going up and down day and night?

4 DR. LAWLER: I have to think back to what was in  
5 there. If it did, it was introduced in the so-called "F"  
6 factors. The "F" factors were discussed in great detail in the  
7 October 30 testimony, but there was some introduction of that  
8 in the April 5 testimony and I don't recall whether that  
9 was used.

10 MR. BRIGGS: And did it consider the tidal flows or  
11 the tidal mixing.

12 DR. LAWLER: No, sir, it did not, because it was  
13 a complete mix of the entire estuary, rather than a segment  
14 by segment approach.

15 MR. BRIGGS: So it was a much less elegant model  
16 than you are proposing to use at the present time, is that  
17 right?

18 DR. LAWLER: Than the Applicant is proposing to use  
19 at the present time? That is correct. I might also  
20 state it was used at the time simply to elevate the operation,  
21 the effect of the operation, of one year of operation of the  
22 plant on the river, rather than a series of years.

23 MR. BRIGGS: Well, in describing the behavior  
24 of the river, does it make any difference whether it is described  
25 for calculations for one year or for more years?

1 DR. LAWLER: Well, I think it does, because I  
2 think that although the impact on the early stages of the  
3 population in any given year would tend to be the same from  
4 year to year, the cumulative effect on the population as a  
5 whole, including the adult population, will continue  
6 to decrease as you move from year to year.

7 MR. BRIGGS: Yes, I don't want to take any more time.  
8 Go ahead with your questions.

9 DR. LAWLER: Does that clarify it?

10 MR. BRIGGS: Yes. Thank you.

11 DR. LAWLER: Can I ask, Mr. Jensch, I have several  
12 lines of questioning here, and if you can indicate to me how  
13 much time we have, I can determine which one to pursue.

14 CHAIRMAN JENSCH: The first word I had was the  
15 building was to be cleared by 4. Then I just had word from the  
16 Commissioner's office that a few minutes longer. So that is  
17 not very explicit, but it is implicit we will have a little  
18 relaxation of the four o'clock rule.

19 Of course, you understand that your witness will  
20 be available tomorrow morning.

21 DR. LAWLER: I understand that. And as I understand  
22 it, we are to meet with Dr. Goodyear this evening to clarify  
23 as many of these points as we can.

24 CHAIRMAN JENSCH: That is something you can work  
25 out, yes.

1                   MR. TROSTEN: Mr. Chairman, rather than move on  
2 to another portion of Dr. Lawler's interrogation, I think  
3 the best thing to do would be, particularly since we are going  
4 to be talking to Dr. Goodyear tonight, would be to try to  
5 conclude the few questions that I have on impingements and then  
6 we would be finished with that topic.

7                   CHAIRMAN JENSCH: All right.

8                   Let's plan to adjourn at about 4:15. Would that  
9 be agreeable?

10                  MR. TROSTEN: Yes.

11                  CHAIRMAN JENSCH: Very well.

12                  BY MR. TROSTEN:

13                  Q         Dr. Goodyear, the Staff's impingement analysis  
14 that is contained on page V-30 -- do you have a copy of that  
15 handy?

16                  A         Yes.

17                  Q         It is correct, is it not, that the impingement  
18 analysis that you made was based on the Applicant's testimony  
19 of October 19, as stated on that page, and the reduced flow  
20 operation which was calculated by the Staff in coming up  
21 with the impingement analysis, was 105,000 gallons per minute.

22                  Is that not the case? I specifically refer you to the --  
23 I refer you to that page and I also refer you to the back-up  
24 information that you provided to Applicant's counsel, Mr. Karman  
25 provided to Applicant's counsel, which has been offered in

1 evidence in this proceeding. That back-up information  
2 does not give the flow rate specifically, but I am just  
3 referring you to it again.

4 CHAIRMAN JENSCH: You may look at the paper if  
5 you desire.

6 THE WITNESS: I recognize the paper. I am not  
7 certain exactly what the question is.

8 BY MR. TROSTEN:

9 Q My question is, is it not the case that the  
10 calculation you made of 5.5 million fish over a six month  
11 period -- and I am referring you here to the sentence in the  
12 middle of the page that says, "At an average weight of .25  
13 ounces per fish, this value for reduced flow corresponds  
14 to about 30,000 per day or 5.5 million over a six months  
15 period."

16 The reduced flow to which you are referring there  
17 is 105,000 gallons a minute, is it not?

18 A I would have to check to make sure that that is  
19 correct. Subject to checking it --

20 Q Would you agree that, subject to checking, that it  
21 was 105,000 gallons per minute?

22 A Yes.

23 Q Are you aware on the base of testimony in this  
24 proceeding -- I am sorry if I can't give you the transcript  
25 page right now, I think your counsel may recall it -- that the

1 Indian Point 2 is going to be operated at 84,000 gallons  
2 per minute during the period from October 1 to March 31?

3 A I am now aware of it.

4 Q Dr. Goodyear, on the base of the calculations  
5 which the Staff made, which are contained on page 5 of the  
6 attachments to Mr. Karman's letter to me of November 10, 1972,  
7 which is in evidence in this proceeding, do you agree that the  
8 number 5.5 million fish would be proportionately reduced by  
9 the ratio of 105,000 to 84,000 gallons per minute if you  
10 had made the calculation on the base of 84,000 gallons per  
11 minute?

12 A Yes.

13 Q Thank you. Now it is the case, is it not,--  
14 excuse me just a moment. It is the case, is it not, Dr.  
15 Goodyear, that the calculation by the Applicant which you used  
16 and which is reflected on page 5-30 of the Final Environmental  
17 Statement, is based upon seven days of operating data? Is that  
18 not true?

19 A As I remember it,

20 MR. TROSTEN: That concludes my examination of  
21 Dr. Goodyear on the impingement question. I have some  
22 additional questions which I probably could conclude by 4:15  
23 with regard to the matter of certain white perch statistics.

24 CHAIRMAN JENSCH: Well, you might use the time for  
25 that if you desire.

1 BY MR. TROSTEN:

2 Q Dr. Goodyear, I would like to refer you to the page  
3 in the Final Environmental Statement, page V-16, which deals  
4 with the white perch population. You say on page V-16, "Many  
5 of the Hudson River fish populations may have the ability to com-  
6 pensate for plant induced increases in mortality." I am reading  
7 from the first full paragraph.

8 "However, available information on shad and on  
9 striped bass along the Atlantic coast shows fairly conclusively  
10 that compensatory capabilities in these species are not the  
11 factors which presently determine the population level. Fur-  
12 thermore, the 1965-1969 NYU fish collection data indicate that  
13 the high mortality of white perch which has resulted from  
14 entrainment and impingement at Indian Point Unit No. 1 could  
15 be adversely affecting the white perch in the Hudson and is  
16 supported by Raytheon Company data which indicates the downward  
17 trend continued into 1970."

18 With regard to your conclusion about the white perch  
19 populations, I have the following questions. The population,  
20 the density of most fish populations tends to fluctuate,  
21 does it not, Dr. Goodyear?

22 A Yes.

23 Q Could any downward trend that actually did exist in  
24 the white perch population during the period 1965 to 1969 be  
25 part of such a fluctuation?

17 A Certainly.

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arl 1 Q You indicated, you have indicated in the course of  
2 this hearing and particularly in connection with Figure 5-9  
3 on page 5-50, that seine haul data is not suitable for  
4 quantitative analysis. Is that correct?

5 A It is probably the least suitable method. However,  
6 the data that are utilized in this figure were taken for  
7 the express purpose of getting quantitative information.

8 MR. MACBETH: When you say "this figure," you are  
9 referring to Figure 5-16?

10 THE WITNESS: Yes. The statement there.

11 BY MR. TROSTEN:

12 Q Doctor, perhaps this evening you could advise me  
13 of the specific place where it is indicated that these data  
14 were collected for that specific purpose. Let me --

15 A The specific, the methodology was specifically  
16 designed to get quantitative data from seine?

17 Q Yes, would you just show me the place in the NYU  
18 on Ratheon studies that indicates that?

19 A One can look --

20 Q You don't have to do it now.

21 A I prefer to do it now. If you look in any one  
22 of the reports that are cited, there will be a discussion,  
23 particularly of Perlmutter's first article.

24 Q What will the discussion say?

25 A This discussion will be concerning itself in part

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1 with the importance of the quantitative aspect and why they  
2 express everything in terms of catch per hundred thousand  
3 square feet.

4 Q Would you identify these places for me tonight when  
5 we talk about this?

6 A Certainly.

7 Q Thank you.

8 Now just in general terms, with regard to seine  
9 haul data, and the ability to use that data for quantitative  
10 purposes, I want to read you a statement from the Carlson  
11 and McCann report that deals with the subject generally and  
12 ask you whether you agree with this general statement. "A  
13 large number of variables associated with the seine haul,  
14 including the physical differences in the seining sites,  
15 prevented quantitative analysis of this type of data." This  
16 is page 25 of the Carlson-McCann report.

17 CHAIRMAN JENSCH: Does that apply only to striped  
18 bass or to white perch, or both?

19 MR. TROSTEN: They were discussing major species  
20 of fish in the Hudson River.

21 Do you agree with that statement?

22 THE WITNESS: Yes.

23 BY MR. TROSTEN:

24 Q Do you know how the seine haul data were collected  
25 by NYU which underlie figure 5-16?

1           A     How they were collected?

2           Q     Yes.

3           A     Other than by seine -- I am not certain what you  
4 mean.

5           Q     You are not familiar with the specific methodology  
6 used in the collection of these data?

7           MR. KARMAN: I think Dr. Goodyear is having some  
8 problem with what methodology you are talking about.

9           THE WITNESS: It is described, the methods that  
10 were used are described. Beyond that --

11           BY MR. TROSTEN:

12           Q     Dr. Goodyear, you indicated a moment ago, and  
13 we will have to look at the specific reference to see what  
14 you had in mind, that these particular seine hauls were  
15 intended to produce quantifiable data, quantitative data.  
16 Can you describe to me how these particular seine hauls  
17 were intended to produce quantitatively reliable data as  
18 opposed to seine hauls generally?

19           A     Other than the fact that they estimated the area  
20 seined, and expressed all of their collections, and all of  
21 the data is expressed in number per units area seined, rather  
22 than number per haul.

23           Q     Is that the only --

24           A     That is the principal method that was employed, to  
25 try to make the data quantitative. I could probably shorten

ar4

1 this discussion quite a bit by saying I don't believe that  
2 the data are particularly good from a quantitative standpoint.  
3 The only thing is that this is the data that was available  
4 and I can't ignore it either.

5 Q What is the range of white perch in the Hudson  
6 River, do you know or have a general idea?

7 A The range?

8 Q Yes, what is the temporal range? Does it range  
9 widely over many miles of the river?

10 A The individual fish?

11 Q No, the population.

12 A Most of the river. Probably some of the more  
13 polluted areas upstream, where the d.o. is very, very low  
14 would not be populated, but the rest of the river would be.

15 Q Do you know how many sampling stations were used  
16 for these seine haul collections?

17 CHAIRMAN JENSCH: Is this in the Carlson-McCann  
18 report?

19 MR. TROSTEN: No, sir, it is in the reports Dr.  
20 Goodyear cited here. Yes, I am sure it is.

21 CHAIRMAN JENSCH: If it is in some documents, can  
22 we assemble the data from the documents?

23 BY MR. TROSTEN:

24 Q Is it correct there were nine sampling stations  
25 in all involved in the NYU sampling? Do you agree?

ar5

1           A     Something like that. There were, from year to  
2 year, variations in the number of sampling stations used.

3           Q     On the order of nine, would you say?

4           A     Something like that, nine to 12.

5           Q     Do you agree that the seining was done on the west  
6 side of the river only?

7           A     No.

8           Q     You do not agree to that. Would you provide me  
9 any evidence that you have that indicates it was not done on  
10 the west side of the river?

11          CHAIRMAN JENSCH: Well, I think the premise of your  
12 question puts the burden on you.

13          MR. TROSTEN: Excuse me.

14          BY MR. TROSTEN:

15          Q     You are not disagreeing, you are simply saying  
16 you don't know?

17          A     No, I am saying there were sampling stations on  
18 the other side of the river in some years.

19          Q     All right. It is my understanding that this is  
20 not the case, but I will have to look at the data that you  
21 have to see if one of us is wrong.

22          Is it correct that there was no sampling done out  
23 in the river itself?

24          A     Yes.

25          Q     Now -- it is pretty hard to seine out in the middle

ar5

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2 year, variations in the number of sampling stations used.

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21 have to see if one of us is wrong.

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23 in the river itself?

24           A     Yes.

25           Q     Now -- it is pretty hard to seine out in the middle

ar6

1 of the river, isn't it. Now how many months per year of  
2 sampling were performed?

3 CHAIRMAN JENSCH: If this is in the NYU report, let's  
4 just take the report and start from there, because you are  
5 giving him a memory course here, and if it is in documentary  
6 form, I think it is unfair to a witness to say out of the  
7 hundreds of documents, where were the sampling stations.  
8 Let's see the documents and start from there.

9 BY MR. TROSTEN:

10 Q Dr. Goodyear, just so we can proceed here, you  
11 have all of the reports, I gather, that you have cited here  
12 and relied on, do you not?

13 A I am not sure I have them all with me, but I have  
14 some.

15 Q When we meet again, would you have the documents  
16 and would you look back through them so we can go through  
17 this?

18 MR. KARMAN: What do you mean, when you meet again?  
19 You mean tonight or in March?

20 MR. TROSTEN: I hope we can meet before March.

21 MR. MACBETH: We are meeting tomorrow, you know.

22 MR. BRIGGS: I wonder whether it would be possible  
23 tomorrow morning, if you people have the reports, to let us  
24 know whether the reports say that the NYU people were intend-  
25 ing to get quantitative data, and whether they were intending

ar7

1 in their studies to determine what the white perch population  
2 is in the river?

3 MR. TROSTEN: All right.

4 MR. BRIGGS: And if citations can be made to  
5 sections in the report that indicate this, I think it would be  
6 helpful.

7 MR. TROSTEN: All right.

8 Mr. Chairman, I don't know exactly how we should  
9 proceed tomorrow. Mr. Macbeth had wanted to cross-examine  
10 tomorrow. We are not finished. I suppose we could have Mr.  
11 Macbeth conclude all of his cross-examination tomorrow,  
12 and then we will have to pick up later.

13 CHAIRMAN JENSCH: All right. Is 8:45 agreeable  
14 tomorrow?

15 MR. MACBETH: Yes.

16 CHAIRMAN JENSCH: At this time let us recess to  
17 reconvene in this room tomorrow morning at 8:45.

18 (Whereupon, at 4:15 p.m., the hearing was adjourned,  
19 to reconvene at 8:45 a.m., Friday, January 19, 1973.)

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