

UNITED STATES DISTRICT COURT  
EASTERN DISTRICT OF LOUISIANA

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IN RE: OIL SPILL BY THE  
OIL RIG *DEEPWATER HORIZON*  
IN THE GULF OF MEXICO ON  
APRIL 20, 2010  
CIVIL

Docket No. MDL-2179  
Section "J"  
New Orleans, LA  
Wednesday, January 21, 2015

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THIS DOCUMENT RELATES TO:

UNITED STATES OF AMERICA

V.

Docket No. 10-CV-4536  
Section "J"

BP EXPLORATION & PRODUCTION,  
INC., ET AL

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TRANSCRIPT OF TRIAL PROCEEDINGS  
HEARD BEFORE THE HONORABLE CARL J. BARBIER  
UNITED STATES DISTRICT JUDGE  
VOLUME II, MORNING SESSION

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Proceedings recorded by mechanical stenography, transcript  
produced by computer.

I N D E XWITNESSES FOR THE GOVERNMENT:PAGE/LINE:DR. DONALD BOESCH

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P R O C E E D I N G S

(WEDNESDAY, JANUARY 21, 2015)

(MORNING SESSION)

1  
2  
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4  
5 (OPEN COURT.)

6 THE COURT: Good morning, everyone. All right. Before we  
7 resume trial, I just want to announce our times as kept by the court  
8 reporters. According to their calculations, the United States  
9 yesterday used three hours, 25 minutes; has 41 hours, 35 minutes  
10 remaining; BP Anadarko have used four hours, three minutes, and have  
11 40 hours, 57 minutes remaining.

12 Next witness -- do you have something?

13 MS. HIMMELHOCH: Oh, I'm sorry, Mr. Brock even asked me  
14 about this. I was advised to speak into the mic.

15 Your Honor, we have agreed among the parties that we will  
16 marshal the evidence offered yesterday tomorrow morning to give  
17 ourselves some time to get the process in order.

18 THE COURT: That's fine.

19 MS. HIMMELHOCH: Thank you, your Honor.

20 THE COURT: Sure.

21 MR. BROCK: Judge Barbier, Mike Brock for BP.

22 I think we would like to start our case on Monday morning,  
23 if that's acceptable to the Court. I do have a couple of witnesses  
24 I could have here Friday, if that was the Court's preference. I am  
25 actually not convinced yet that the government's case isn't going to

08:07:47 1 go into Friday, and I think, for planning purposes, that would be  
08:07:53 2 much more efficient for us and we can get the witnesses in the  
08:07:56 3 sequence that we would like to, if that's still okay with the Court.  
08:07:58 4 I think we're in good shape on time.

08:08:01 5 THE COURT: I don't see any problem with that, we can do  
08:08:03 6 that. Let's just plan -- regardless on when the government finishes  
08:08:06 7 their case, assuming they finish this week, which we are  
08:08:09 8 expecting -- the BP/Anadarko case will start on Monday.

08:08:15 9 MR. BROCK: Thank you, Judge.

08:08:16 10 THE COURT: Okay. Sure.

08:08:40 11 MS. ANDRE: Good morning, your Honor, Abigail Andre for  
08:08:43 12 the United States. I'll have our next witness on direct. The  
08:08:52 13 United States calls Dr. Donald Boesch.

08:08:52 14 THE COURT: Is he in the courtroom? Okay.

08:09:01 15 THE DEPUTY CLERK: If you'll raise your right hand.

08:09:03 16 (WHEREUPON, DR. DONALD BOESCH, WAS SWORN IN AND TESTIFIED AS  
08:09:06 17 FOLLOWS:)

08:09:06 18 THE DEPUTY CLERK: If you'll take a seat. If you'll state  
08:09:09 19 and spell your name for the record.

08:09:14 20 THE WITNESS: My name is Donald Boesch, D-O-N-A-L-D,  
08:09:18 21 B-E-O-S-C-H.

08:09:23 22 MR. BROCK: Your Honor, we do have one motion related to  
08:09:26 23 Dr. Boesch. It's not crafted in the *Daubert* format, but it's a  
08:09:34 24 motion to exclude testimony that Dr. Boesch, and actually Dr. Rice  
08:09:39 25 will offer later, we think, that goes to the issue of their

08:09:44 1 expressing opinions about concerns, potential for things to happen.  
08:09:52 2 Some of these things fall into the category of speculation. We  
08:09:57 3 think that those topics are potentially appropriate for an NRD  
08:10:01 4 proceeding later but do not rise to the level of proof that's  
08:10:07 5 required for this trial. A hypothesis-generating study is not  
08:10:16 6 evidence that anything has occurred, and so on that basis, we would  
08:10:20 7 renew our motion.

08:10:20 8 THE COURT: All right. I've read the motion and briefing  
08:10:23 9 on it. I am going to overrule or deny your motion. I think, with  
08:10:27 10 respect to essentially all of these *Daubert* motions which BP has  
08:10:31 11 filed on every expert, I have to tell you filing a *Daubert* motion on  
08:10:37 12 every expert in a case kind of undermines your credibility a little  
08:10:40 13 bit, you know.

08:10:42 14 But having said that, with respect to these experts and  
08:10:45 15 most of the others, they are all eminently qualified by reason of  
08:10:51 16 education, training, and experience, and that goes for BP's experts  
08:10:55 17 as well as in the last trials. And I think for the most part,  
08:10:59 18 particularly since this is a bench trial, the better procedure is to  
08:11:05 19 object to the questions or lines of questioning as we proceed and I  
08:11:13 20 think I can sort all of this out when I decide the case in terms of  
08:11:17 21 what I rely on or don't rely on. You can certainly make those  
08:11:20 22 arguments, okay?

08:11:22 23 MR. BROCK: Is it okay for the Court for this witness on  
08:11:25 24 the issue of potential injury, speculation --

08:11:28 25 THE COURT: Well, that's the whole point and I think part

08:11:31 1 of the issue in this case is the government and BP seem to be like  
08:11:35 2 ships passing in the night. They're operating on different planes  
08:11:40 3 or different planets, and I am not deciding now who is right or who  
08:11:44 4 is wrong about that. But the government's position -- and this will  
08:11:49 5 all be briefed post trial -- is that one of the considerations the  
08:11:54 6 Court has to take into account is the potential for future harm,  
08:12:02 7 long-lasting or permanent harm. BP apparently believes that that  
08:12:07 8 can only be the subject of an NRD action as I appreciate your  
08:12:11 9 argument, essentially. And if they can't prove it now, then it  
08:12:14 10 shouldn't be allowed in. I'll let you all make those arguments post  
08:12:19 11 trial.

08:12:20 12 MR. BROCK: Okay. Thank you.

08:12:21 13 THE COURT: Okay.

08:12:23 14 MS. ANDRE: Thank you, your Honor.

08:12:23 15 THE COURT: All right. Sure.

08:12:23 16 VOIR DIRE EXAMINATION

08:12:23 17 BY MS. ANDRE:

08:12:27 18 Q. Will you please introduce yourself to the court.

08:12:30 19 A. I am Dr. Donald Boesch, I'm with the University of Maryland  
08:12:33 20 Center for Environmental Science.

08:12:35 21 Q. What question were you asked to address in this case?

08:12:37 22 A. I was asked to assess which components of the ecosystems of the  
08:12:41 23 Gulf of Mexico suffered harm.

08:12:44 24 Q. And what is your expertise as it relates to the work that you  
08:12:47 25 did in this case?



08:12:48 1 A. I have many years of experience in assessment of ecosystems --  
08:12:53 2 coastal ecosystems, in particular -- and ocean ecosystems that  
08:12:58 3 require bringing together very diverse information from disciplines  
08:13:03 4 to draw conclusions.

08:13:04 5 Q. Have you prepared a slide summarizing your relevant work and  
08:13:07 6 educational experience?

08:13:08 7 A. I have.

08:13:09 8 Q. Please call up D-32150. What degrees do you hold, Dr. Boesch?

08:13:15 9 A. I hold a Bachelor's degree in biology from Tulane University and  
08:13:19 10 a Ph.D. in marine science from the College of William & Mary. In  
08:13:24 11 addition to that, I held a Fulbright postdoctoral fellowship at the  
08:13:29 12 University of Queensland in Australia.

08:13:31 13 Q. What do you do in your role as president of the University of  
08:13:35 14 Maryland Center of Environment Science?

08:13:35 15 A. As president, I am the CEO of the institution as well as its  
08:13:40 16 chief academic officer. So in that role, I supervise the work of  
08:13:46 17 8700 faculty members who are engaged in studies very appropriate to  
08:13:50 18 the issues here, including physical oceanography, chemistry,  
08:13:55 19 microbiology, fishery science, and toxicology economics,  
08:14:00 20 environmental economics, those fields.

08:14:02 21 Q. And what work did you do on the Exxon Valdez spill?

08:14:07 22 A. I was a consultant to the federal state trustee agencies as they  
08:14:14 23 began to do the damage assessment for the Exxon Valdez spill.

08:14:18 24 Q. Please describe your work for the National Academy of Science.

08:14:21 25 A. Well, over the years, I've been involved in numerous -- I think

08:14:27 1 13 study -- panel studies done by the National Academy of Science on  
08:14:31 2 a wide range of topics. In addition to that, I served fairly  
08:14:34 3 recently a three-year term as chair of the Ocean Studies Board, one  
08:14:39 4 of the standing boards of the National Academy.

08:14:42 5 Q. And do you have any previous experience working on the *Deepwater*  
08:14:46 6 *Horizon* spill?

08:14:47 7 A. Yes, I have. Because I was appointed as one of the seven  
08:14:51 8 commissioners, members of the National Commission on BP *Deepwater*  
08:14:57 9 *Horizon* Oil Spill and Offshore Drilling that did its work under our  
08:15:02 10 chair, under our co-chairs, former Senator Graham and former EPA  
08:15:07 11 Administrator Riley, and delivered a report to the president and  
08:15:11 12 Congress.

08:15:11 13 Q. Why did you take that position when it was offered to you?

08:15:14 14 A. Well, you know, when the president asks you to do something, you  
08:15:18 15 generally try to do it. In addition to that, I grew up here on the  
08:15:23 16 Gulf Coast, spent many -- much time along the Coast as well as in  
08:15:29 17 Louisiana where I grew up, as well as have come back here to do  
08:15:34 18 research in the Gulf of Mexico during the 80s. So I felt I had an  
08:15:38 19 obligation to bring that knowledge and understanding to bear to  
08:15:42 20 address this issue.

08:15:42 21 Q. Do you have any publications relating to ecosystem analysis?

08:15:47 22 A. Yes. There are about 70 of my publications dealing, one way or  
08:15:53 23 another, with analysis of ecosystems as they are affected by human  
08:15:57 24 activities.

08:15:59 25 Q. Please call up the first pages of TREX 13183, 13184, and 12185R.

08:16:09 1 Dr. Boesch, do you recognize these documents?

08:16:11 2 A. Yes, they're the three reports I prepared for this trial.

08:16:14 3 Q. And Dr. Stanley Rice helped write the round 2 report, correct?

08:16:22 4 A. Yes. I wrote, my initial expert report on my own, and I had  
08:16:28 5 seen Dr. Rice's report at that time and just to verify whether the  
08:16:34 6 conclusions that I drew were appropriate, given his analysis.

08:16:38 7 And then in the round 2 report, we actually collaborated  
08:16:44 8 on it. I addressed the bigger picture ecosystem level affects and  
08:16:49 9 he was worked very deeply in the issue of environmental toxicology,  
08:16:55 10 which is his expertise, and I brought that into our analysis. So I  
08:17:00 11 adopted his report in full.

08:17:01 12 The third report -- round 3 report I developed on my own.

08:17:01 13 BY MS. ANDRE:

08:17:06 14 Q. Please call up TREX 13183.47. Dr. Boesch, is this a current  
08:17:14 15 copy of your curriculum vitae as it appears in your round 1 report?

08:17:19 16 A. Yes, it is.

08:17:19 17 Q. Does it accurately summarize your qualifications and  
08:17:21 18 publications?

08:17:22 19 A. I believe it does.

08:17:24 20 MS. ANDRE: Your Honor, at this time, I tender Dr. Donald  
08:17:27 21 Boesch as an ecosystems specialist.

08:17:29 22 THE COURT: All right. Any questions beyond the *Daubert*  
08:17:32 23 motion that was filed?

08:17:34 24 MR. BROCK: Not beyond what we've raised already, your  
08:17:36 25 Honor.

08:17:36 1 THE COURT: Okay. He is accepted. Go ahead.

08:17:38 2 DIRECT EXAMINATION

08:17:38 3 BY MS. ANDRE:

08:17:40 4 Q. Do your rounds 1, 2, and 3 expert reports accurately summarize  
08:17:44 5 your opinions in this matter and the bases for those opinions?

08:17:46 6 A. Yes, I do. Other than a few inconsequential details that I  
08:17:51 7 would probably correct now with the benefit of time, yes, they do.

08:17:54 8 Q. And do you adopt these reports as your testimony here today?

08:17:57 9 A. I do.

08:17:58 10 MS. ANDRE: At this time, we also move in Dr. Boesch's  
08:18:02 11 expert reports TREX 13183, 13184, and 13185R.

08:18:09 12 THE COURT: We'll take up the admission of all of the  
08:18:11 13 exhibits in accordance with the procedure as Ms. Himmelhoch referred  
08:18:15 14 to.

08:18:15 15 MS. ANDRE: Thank you, your Honor.

08:18:17 16 BY MS. ANDRE:

08:18:20 17 Q. First, Dr. Boesch, I would like to have you summarize some of  
08:18:23 18 your conclusions.

08:18:24 19 As a preliminary matter, did the Macondo oil spill harm  
08:18:27 20 the Gulf ecosystem?

08:18:29 21 A. Yes, I concluded, based upon all of the evidence and literature  
08:18:31 22 that I've reviewed, that it did result in serious harm to a number  
08:18:35 23 of components of both offshore and coastal systems. Basically  
08:18:39 24 everywhere the oil went, it created harm.

08:18:41 25 Q. Now, how did you categorize those harms in your report?

08:18:45 1 A. I categorized the harms, attempting to be very rigorous and  
08:18:49 2 careful, as "actual harm," that is based upon where we thought that  
08:18:55 3 the evidence is very strong that there was -- could demonstrate harm  
08:18:59 4 without serious question; and "potential harm," that is where there  
08:19:03 5 was evidence that probably there was harm but one -- I couldn't draw  
08:19:06 6 the conclusion that there actually was, based upon the information  
08:19:09 7 available at this time.

08:19:10 8 Q. Have you prepared a slide to explain specifically what you mean  
08:19:14 9 by "actual" and "potential harm"?

08:19:15 10 A. I have.

08:19:17 11 Q. Please call up D-12151. What do you mean when you use the term  
08:19:23 12 "actual harm"?

08:19:24 13 A. Well, as I said, where there was a demonstrated effect that  
08:19:29 14 altered the natural functions and populations in an ecosystem. And  
08:19:34 15 I used, as a basis of that, information that were observations from  
08:19:39 16 the field, generally where harm was actually observed.

08:19:41 17 So, for example, if there were clear evidence where a  
08:19:45 18 number of birds were killed by oiling, I mean, that's pretty obvious  
08:19:50 19 demonstration of actual harm. Or if a marsh was oiled and eroded  
08:19:55 20 away, that's actual harm.

08:19:58 21 Q. What did you mean when you used the term "potential harm" in  
08:20:01 22 your report?

08:20:01 23 A. Well, potential harm, I reviewed the information and determined  
08:20:06 24 whether that, although the evidence suggests there may be harm, I  
08:20:12 25 could not unambiguously demonstrate that it actually occurred, based

08:20:16 1 upon that evidence. So, for example, if one measures the  
08:20:22 2 concentrations of oil in the environment and we know the toxicity  
08:20:28 3 levels, and that's a procedure used both by Dr. Shea, the BOP  
08:20:34 4 expert, and Dr. Rice, for example, and then if the toxicity  
08:20:40 5 concentrations -- the concentrations which elicit toxicity are  
08:20:45 6 within the bounds of what was observed, you know, indicate that  
08:20:50 7 effect could occur, I considered that probable harm, not actual harm  
08:20:54 8 but probable harm because we haven't actually measured the changes  
08:20:58 9 in the populations and the functions that are predicted by that  
08:21:02 10 comparison.

08:21:03 11 Q. Could potential harm become actual harm?

08:21:05 12 A. Yes, it could. Because there is a vast amount of work still  
08:21:10 13 going on with National Resources Damage Assessment and a tremendous  
08:21:14 14 amount of independent research going on as well. That results in  
08:21:19 15 new publications virtually every week that give us more of an  
08:21:22 16 insight. So as time goes on, maybe some of these areas would move  
08:21:27 17 to the area of actual harm.

08:21:28 18           And there may be some areas that I thought, at this time  
08:21:32 19 the evidence doesn't even rise to the level of potential harm, that  
08:21:36 20 could be potentially or actually harmed as well.

08:21:38 21 Q. So I want to follow-up on that. There were other categories of  
08:21:42 22 harm that you considered in preparing your report but did not  
08:21:46 23 include as potential or actual harm, correct?

08:21:49 24 A. Yes. There are, of course, a wide range of concerns that have  
08:21:55 25 been related to the effects of the oil spill. Some of those, I

08:21:59 1 looked at but I couldn't convince myself, based upon the information  
08:22:04 2 in the scientific literature, that were at this point potential.  
08:22:09 3 They're speculative in that sense, but there is no real solid basis  
08:22:13 4 of concluding that there was a strong potential that harm occurred.

08:22:17 5 Q. What have past oil spills taught you about how long signs of  
08:22:23 6 harm might take to surface?

08:22:25 7 A. Well, you know, these effects can dissipate quickly but also can  
08:22:31 8 be revealed later on, as both additional studies are done. But also  
08:22:35 9 sometimes there are repercussions in an ecosystem. One of the most  
08:22:41 10 widely cited is the collapse of populations of herring after the  
08:22:45 11 Exxon Valdez. I know there's speculation and controversy about  
08:22:49 12 exactly the cause, but it's indicative of the kinds of things that  
08:22:52 13 might occur down the road after a disturbance like this.

08:22:58 14 Q. Have you prepared a slide summarizing your conclusions regarding  
08:23:01 15 actual harm caused by the BP oil spill?

08:23:04 16 A. I have.

08:23:04 17 Q. Please call up D-32152. Now, we'll discuss these conclusions in  
08:23:10 18 more detail, but for now, please briefly describe your conclusions  
08:23:14 19 regarding actual harm.

08:23:16 20 A. Well, I'll try to treat these in terms of the path of the oil  
08:23:20 21 coming out of the wellhead.

08:23:24 22 So the first environment ecosystem to experience this oil  
08:23:27 23 is the deep Gulf of Mexico. And as we'll reveal, quite a lot of the  
08:23:33 24 oil and the gas remained in the deep Gulf. That actually had  
08:23:38 25 consequences on the ecosystems, including affecting deep seabed

08:23:43 1 organisms where this material was deposited, as well as coral, cold  
08:23:48 2 water coral sparsely distributed populations in the deep waters in  
08:23:52 3 the Gulf.

08:23:53 4           As the oil rose to the surface, we all know that there  
08:23:56 5 were very dense mats of slicks of oil floating around, that  
08:24:01 6 entrained floating seaweed, important habitat that had important  
08:24:06 7 resources associated with it, sunk that seaweed. In addition to  
08:24:09 8 that, air-breathing animals such as sea turtles, dolphins, birds,  
08:24:17 9 things that have to travel across the air sea surface to travel or  
08:24:21 10 feed, they're obviously exposed and obviously mortalities, but we'll  
08:24:24 11 talk more about them as well.

08:24:26 12           And then as that oil floated in the Gulf in the near  
08:24:28 13 surface, some of that oil actually was entrained again into the  
08:24:32 14 water column by waves, by dispersant application, that affected the  
08:24:38 15 near-surface plankton. There's evidence, strong evidence that that  
08:24:41 16 occurred as well.

08:24:42 17           And then as the oil moved ashore and impacted the coast,  
08:24:46 18 obviously shorelines, generally, but particularly the marshes and  
08:24:50 19 mangroves of the Gulf Coast -- which are important habitats but also  
08:24:54 20 are very susceptible because it's difficult to remove oil from  
08:24:57 21 them -- were affected. And the associated animals that provide the  
08:25:02 22 productivity of the system also, suffered the ill effects of that.

08:25:05 23 Q. Have you prepared a slide summarizing your conclusions regarding  
08:25:08 24 potential harm caused by the BP spill?

08:25:10 25 A. I have.



08:25:11 1 Q. Please call up D-32153. Now, please briefly describe your  
08:25:18 2 conclusions regarding potential harm.

08:25:20 3 A. Well, again, following the same path from the deep Gulf to the  
08:25:23 4 coastline, there is evidence that the biota on the outer continental  
08:25:31 5 shelf could potentially have been affected because of the elevated  
08:25:35 6 concentrations of oil contaminants in the sediments. But in  
08:25:38 7 particular, there is evidence in the literature that fish that live  
08:25:43 8 at the near -- nearest sediments on the bottom on the outer shelf  
08:25:48 9 had sub lethal consequences of that. We'll talk about that some  
08:25:52 10 more.

08:25:53 11 And then as we moved in, moved out to the surface, surface  
08:25:56 12 waters, there is the same kind of evidence that I mentioned of  
08:26:00 13 toxicity levels and concentrations that match that suggest potential  
08:26:04 14 harm to ocean fishes, the larvae of which live at that near surface  
08:26:10 15 interface. And then as the oil came ashore, there is still  
08:26:13 16 lingering concern that this is somehow responsible -- the spill or  
08:26:18 17 response is responsible for the depletion and reduction of oyster  
08:26:23 18 population --

08:26:23 19 THE COURT: I have a question for you, excuse me. Give me  
08:26:27 20 some examples of "sub lethal consequences."

08:26:33 21 THE WITNESS: This is with respect to which --

08:26:35 22 THE COURT: I think you used that in connection with --  
08:26:38 23 said there's evidence in the literature that fish live at or near  
08:26:41 24 the sediments on the bottom and had -- there were sublethal  
08:26:45 25 consequences.

08:26:46 1 THE WITNESS: There's two lines of evidence, your Honor,  
08:26:48 2 that we will review in some detail. One of them is the higher  
08:26:51 3 incidents of skin lesions in fish that are associated with the  
08:26:54 4 bottom sediments in that area.

08:26:57 5 Second, in those same fish, elevated concentrations of  
08:27:01 6 petroleum hydrocarbons, particularly the pHs that we talked about,  
08:27:06 7 the polycyclic aromatic hydrocarbons in their liver, which is the  
08:27:10 8 organ that detoxifies if they're exposed to it. And also the  
08:27:14 9 metabolites, the breakdown products of those in the bile of the  
08:27:17 10 fish.

08:27:17 11 So this indicates that the fish are somehow being stressed  
08:27:21 12 or contending with this, but it doesn't -- that's why it's  
08:27:24 13 "potential," it doesn't rise to the level of evidence that the fish  
08:27:27 14 actually died or the population suffered at this point in time.

08:27:31 15 THE COURT: Okay. Go ahead.

08:27:31 16 BY MS. ANDRE:

08:27:34 17 Q. Dr. Boesch, is another way you can describe sub lethal harm as  
08:27:38 18 "chronic harm"?

08:27:39 19 A. Yes, indeed. Perhaps that's probably the preferred definition,  
08:27:44 20 a term that's used because, even though the effects may be initially  
08:27:48 21 not lethal, they're chronic. They create chronic effects which  
08:27:52 22 could at some point in time effect the survival of the individual  
08:27:56 23 and effect the population.

08:27:58 24 Q. Now, in your report you say that potential harm was realized to  
08:28:04 25 at least the resources listed here. What did you mean by "at

08:28:08 1 least"?

08:28:08 2 A. Well, as I mentioned earlier, there are other things that could  
08:28:12 3 be affected in which there's not sufficient evidence, documentation  
08:28:20 4 in the scientific literature which suggests to me that there is a  
08:28:27 5 strong potential for an effect.

08:28:28 6 But as I said, you know, there's a lot of ongoing studies.  
08:28:34 7 Most of the evidence, the most data available, data resulting from  
08:28:38 8 the National Resources Damages Assessment is not publicly available,  
08:28:42 9 and almost none of the interpretations of that are available or  
08:28:46 10 available to me. So I want to --

08:28:50 11 I tried to be very conservative in my assessments, but  
08:28:54 12 want to recognize and the court to recognize there may be some  
08:28:57 13 things that are still going to come out that could be affected. But  
08:29:01 14 I didn't feel that it was my responsibility to speculate on them,  
08:29:04 15 unless there was significant evidence.

08:29:06 16 Q. You just mentioned what you relied upon in your report. I want  
08:29:11 17 to talk a little more about your methodology. Did you prepare a  
08:29:16 18 slide describing your methods?

08:29:17 19 A. I did.

08:29:17 20 Q. Please call up D-32154. First, what sources of literature did  
08:29:25 21 you rely on?

08:29:26 22 A. Well, when I was asked to do this assessment, I felt it really  
08:29:31 23 important that I use the fairly abundant and growing scientific  
08:29:35 24 literature on this spill. These papers began to appear, literally,  
08:29:41 25 weeks after the well was capped, but have been, literally now over

08:29:44 1 300 papers that are relevant on this -- effects of the oil spill.  
08:29:49 2 So they include papers related to where the oil went, what happened  
08:29:53 3 to it, what are the effects on organisms, and so all of those I had  
08:29:57 4 to read and pull together and integrate.

08:30:01 5 I relied on the scientific literature for a number of  
08:30:04 6 reasons. First of all, I am trying to assess virtually everything  
08:30:09 7 and the effects in the publicly available database. The big  
08:30:13 8 database that the Court talked about yesterday, it doesn't include a  
08:30:17 9 lot of the things that I'll be talking about in terms of the  
08:30:20 10 evidence of impacts.

08:30:21 11 In addition to that, I think, that analysis of those  
08:30:24 12 original data are really best left up to the subject matter experts,  
08:30:29 13 and subjected to peer review.

08:30:30 14 So what I looked at was the peer-reviewed literature,  
08:30:33 15 for the most part, that is relevant, but it also had the benefit of  
08:30:36 16 having been reviewed by scientific peers, sufficient to be  
08:30:40 17 published, and that meant the authors had to correct any problems or  
08:30:44 18 mistakes. It also -- I looked at -- not only just accepted their  
08:30:49 19 conclusions, but reviewed their evidence and conclusions.

08:30:51 20 And then, the other important thing is that many of  
08:30:54 21 these papers actually come from some of the most prestigious  
08:30:57 22 journals that we have in this nation. To a scientist, that matters  
08:31:02 23 because of the editorial standards, the publication standards.

08:31:06 24 Q. Did you review any scientific literature that was not  
08:31:08 25 specifically about the BP oil spill?

08:31:10 1 A. Yes. Because as one reads the paper, one has to, then, learn  
08:31:15 2 more about -- well, I used this technique and I wanted to find out  
08:31:19 3 the assumptions of that technique with that kind of analysis. So  
08:31:22 4 that often resulted in reading a lot of more literature that wasn't  
08:31:27 5 on the Macondo well blowout, but on other issues that supported the  
08:31:32 6 author's interpretations and conclusions.

08:31:34 7 Q. Now, what other sources of information did you rely on?

08:31:37 8 A. Well, in some cases, there is very little in the literature yet,  
08:31:43 9 as I mentioned. And so I, then, had to go to the data tables, data  
08:31:49 10 sources that are available on the impacts of the spill. We will be  
08:31:53 11 talking about one, for example, that summarizes the number of birds,  
08:31:58 12 turtles, and mammals that were collected and whether they were  
08:32:01 13 oiled. That's just an example.

08:32:03 14 In a few cases I relied on a technical report, usually  
08:32:07 15 by a government agency, which hadn't been subject to the same peer  
08:32:12 16 review, but I felt was germane and important to the issue before me.

08:32:16 17 Q. Now, what role did Dr. Rice's work in this case have in your  
08:32:21 18 assessment? You already mentioned some about the drafting process.  
08:32:25 19 Can you talk specifically what areas he focused on?

08:32:28 20 A. Yes. It was very critical to me because I am not a  
08:32:32 21 toxicologist. I read the papers that deal with the toxic effects,  
08:32:39 22 for example, of Macondo well oil on fish larvae. I understand the  
08:32:45 23 context of that and what it would mean to the fish populations, but  
08:32:47 24 it was Dr. Rice who actually had the expertise, not only on those  
08:32:51 25 papers, but on the methodology used on the chemistry and the

08:32:54 1 assumptions about chemistry. So he prepared that deep dive on that  
08:33:00 2 issue. And I interpreted -- brought that into my broader analysis  
08:33:04 3 about what it could mean to the populations and ecosystems.

08:33:08 4 Q. You won't be testifying to Dr. Rice's results here today,  
08:33:12 5 correct?

08:33:12 6 A. No, no, I think he will do that.

08:33:14 7 Q. Looking back at the slide, are these documents on the bottom  
08:33:19 8 here examples of the formal scientific literature you relied upon?

08:33:22 9 A. Yes, those are just three examples, but just to pick three. The  
08:33:26 10 one on the left deals with the extent of shoreline oiling that was  
08:33:31 11 done from the shoreline cleanup and assessment technique approach  
08:33:36 12 done by -- coauthored by both government and scientists working for  
08:33:41 13 BP.

08:33:42 14                   Second deals with the impacts on cold water  
08:33:46 15 corals. These deep corals that live on outcrops down in the deep  
08:33:50 16 Gulf. And one on the far right, I don't know what it is. That  
08:33:58 17 deals with the issue that the Judge asked me about, that is this  
08:34:03 18 issue of skin lesions and toxic contaminant levels in the liver and  
08:34:10 19 bile of deepwater fishes.

08:34:12 20 Q. Let's clarify these for the record. So the first one you  
08:34:14 21 mentioned is a paper by Dr. Michel, et al, including Dr. Taylor, an  
08:34:20 22 expert in this case. It's TREX 12199 and entitled "Extent and  
08:34:25 23 Degree of Shoreline Oiling, *Deepwater Horizon* Oil Spill, Gulf of  
08:34:28 24 Mexico USA."

08:34:29 25                   The second is a paper by Dr. Fisher, et al, and is TREX

08:34:36 1 231547 entitled "Coral Communities as Indicators of Ecosystem Level  
08:34:43 2 Impacts of the *Deepwater Horizon* Spill."

08:34:45 3 And the third -- Mr. Jackson, can you please blow that  
08:34:49 4 up a little? It's difficult to read. It's a paper by Dr. Murawski,  
08:34:57 5 et al, about fish lesions, as you said. And let me just wait for it  
08:35:02 6 to come up so I make sure I get the TREX into evidence properly.

08:35:21 7 The TREX number for this is 231516 and the title is "Prevalence of  
08:35:31 8 External Skin Lesions and Poly" -- I apologize, your Honor. This is  
08:35:40 9 not the best way to do this one.

08:35:41 10 It's entitled "Prevalence of External Skin Lesions and  
08:35:46 11 Polycyclic Aromatic Hydrocarbon Concentrations in Gulf of Mexico  
08:35:49 12 Fishes, Post *Deepwater Horizon*."

08:35:52 13 Thank you. You can take that down, Mr. Jackson.

08:35:55 14 Now, Dr. Boesch, I would like to change gears and  
08:35:59 15 discuss the physical extent of the spill. Have you prepared a slide  
08:36:03 16 illustrating the geographic area that you considered in your  
08:36:06 17 assessment?

08:36:06 18 A. I have.

08:36:07 19 Q. Please call up D-32155A. First, can you explain what offshore  
08:36:16 20 region you considered in your analysis?

08:36:19 21 A. Well, first, this large mass out in the Gulf with shades of gray  
08:36:26 22 is the cumulative footprint of the oil when it was floating on the  
08:36:30 23 surface waters of the Gulf. The darker the shade, the more days the  
08:36:35 24 oil was there. So the lighter the shade, oil was there just for a  
08:36:41 25 few days.

08:36:41 1           So it's this region where the oil went that I think is the  
08:36:45 2 critical bounds of the assessment that one should focus on. And you  
08:36:53 3 will -- and the -- yeah. So that's the area where -- and the area  
08:36:58 4 around that we would want to go look for effects.

08:37:03 5 Q. Approximately how large was that area?

08:37:05 6 A. That area on this image is 45,000 square miles based upon NOAA's  
08:37:11 7 data set from satellite images. There are other parties that have  
08:37:16 8 assessed these satellite images as well. Mind you, these are  
08:37:21 9 snapshots taken, so you don't see the full movie. So others have  
08:37:24 10 assessed the same data and have come up with a slightly larger area  
08:37:29 11 of 68,000 square miles. But, roughly, in the same region.

08:37:33 12 Q. In your mind, does it matter which of these estimates, 45,000 or  
08:37:38 13 68,000, is actually correct?

08:37:40 14 A. Well, you know, from the standpoint of our analysis it doesn't  
08:37:44 15 because they both define generally the area where the concentrations  
08:37:48 16 and exposure to oil was most likely and heaviest.

08:37:51 17 Q. What shoreline area did you consider?

08:37:57 18 A. Well, the shoreline indicated in blue is the shoreline that was  
08:38:03 19 covered during these shoreline cleanup and assessment technique  
08:38:07 20 surveys that were done by both the responsible party, and the  
08:38:13 21 government responses, and the Unified Command. So that doesn't mean  
08:38:17 22 that all of that shoreline was oiled. In fact, only a portion of  
08:38:20 23 that shoreline was oiled.

08:38:21 24           But again, with respect to focusing my analysis, this is  
08:38:24 25 the area that I would want to know what the harm is or where the oil



08:38:30 1 likely went.

08:38:31 2 Q. Approximately how many miles of shoreline were oiled?

08:38:34 3 A. This SCAT surveys indicated approximately 1,100 miles, linear  
08:38:43 4 miles of shoreline oiled. Just to put this in context, I checked it  
08:38:47 5 yesterday, that's slightly less than the distance from this  
08:38:51 6 courthouse to the U.S. Capital in Washington, D.C.

08:38:55 7 Q. You can take the slide down, Mr. Jackson. Thank you.

08:38:58 8 How did the amount of oil released impact your  
08:39:01 9 analysis?

08:39:01 10 A. Well, I think it's important. It's important to recognize that  
08:39:06 11 the government, whether it's the government's estimate of  
08:39:09 12 4.2 million barrels of oil or the Court's determination of 3.2 that  
08:39:13 13 this release was unprecedented in U.S. waters, and, certainly, from  
08:39:19 14 an offshore oil and gas production installation. It lasted for  
08:39:24 15 87 days.

08:39:25 16 And in addition to that, I think, it's important to think  
08:39:28 17 not only the total amount of oil, but the actual -- especially when  
08:39:32 18 we talk about the deepwater environment -- the flow rate. The  
08:39:35 19 amount of oil that was being ejected pretty quickly in large volumes  
08:39:39 20 over a period of time.

08:39:41 21 Q. Did you give any consideration to the use of dispersant in this  
08:39:45 22 case?

08:39:45 23 A. Well, yes, we didn't assess the wisdom of applying dispersants  
08:39:53 24 because it's already been done. But recognizing when one puts  
08:39:57 25 dispersants on oil, whether that was injection at the wellhead or

08:40:03 1 spraying the surface, the intent is to keep the oil in the water and  
08:40:08 2 off of the surface where it could come to shore. That is not  
08:40:12 3 removal of the oil. That is injection of the oil into the aquatic  
08:40:17 4 system, even though it may or may not enhance the biodegradation  
08:40:22 5 rate depending on the circumstances. It means that you're making a  
08:40:25 6 trade-off of putting more of the toxic components of the oil into  
08:40:28 7 the aquatic system to keep it off the shoreline.

08:40:32 8           So in that sense, it is a factor with both respect to the  
08:40:36 9 deepwater plume as well as the near surface waters, that is what  
08:40:40 10 that contributed to toxic exposure.

08:40:43 11 Q. So to make sure we're clear, you're testifying that dispersant  
08:40:48 12 does not remove oil from the environment?

08:40:49 13 A. That's right. It basically mixes that oil. It's designed to  
08:40:54 14 break the oil up into small particles and promote dissolution as  
08:41:00 15 well as enhanced degradation. But to keep it off the surface;  
08:41:04 16 reduce the likelihood the oil would come ashore.

08:41:09 17 Q. Have you prepared a slide illustrating BP's consideration of the  
08:41:13 18 geographic extent of the spill?

08:41:14 19 A. Yes, I have.

08:41:15 20 Q. Please, call up D-32156. How did the approaches of BP's  
08:41:21 21 experts, Dr. Taylor and Dr. Paskewich, differ from your own when  
08:41:27 22 considering the geographic extent of the spill?

08:41:30 23 A. Well, first of all, their experts expressed results as a small  
08:41:34 24 percentage of a very large universe of samples in area. So it  
08:41:39 25 doesn't tell you exactly what the consequences are where the oil

08:41:42 1 went, but it tries to put it into a very bigger context.

08:41:46 2           So in the shoreline treatment, the shoreline issue Dr. --  
08:41:50 3 both Dr. Paskewich -- Captain Paskewich and Dr. Taylor have graphs  
08:41:57 4 to show minimize, sort of trivialize the amount of shoreline by  
08:42:01 5 showing it compared to all of the shoreline in the survey. Well,  
08:42:04 6 many of the surveys were done just to check to make sure that oil  
08:42:07 7 wasn't there. So I think that's a trivialization of what isn't  
08:42:12 8 quite a large area of oil.

08:42:14 9           So just to put it in context again, as I said,  
08:42:21 10 1,100, 1,138 if you include the areas in Texas where there was trace  
08:42:26 11 oiling observed, of shoreline were documented. And we'll talk a  
08:42:36 12 little bit more about whether that's an accurate estimate of the  
08:42:38 13 full consequences, but, of that, about 360 miles was heavily or  
08:42:45 14 moderately oiled. That's about -- that's 78 percent more than the  
08:42:51 15 amount of moderate to heavy oiling of any previous oil spill in this  
08:42:55 16 country, or in most places in the world I would think.

08:42:58 17           So in that sense, it trivializes the real consequences of  
08:43:01 18 a very large area of shoreline, extent of shoreline that was oiled.

08:43:05 19 Q. Now, you just said --

08:43:07 20           MR. BROCK: Your Honor, I'm sorry. I just want to note an  
08:43:09 21 objection to this demonstrative briefly, just reserve my objection  
08:43:14 22 to it. I don't think I have been served with this one. But I think  
08:43:18 23 you should proceed, but I just want to note.

08:43:21 24           THE COURT: Where does this come from? I, frankly,  
08:43:23 25 thought from the questioning that this was BP's exhibit or

08:43:28 1 something.

08:43:29 2 MS. ANDRE: Your Honor, this is from page 10 of  
08:43:32 3 Dr. Boesch's round 2 report. It's TREX 13184.010, and it's directly  
08:43:40 4 lifted from his report. It's figure No. 2.

08:43:45 5 THE COURT: From Dr. Boesch's report?

08:43:47 6 MS. ANDRE: Yes, your Honor.

08:43:48 7 THE COURT: I thought -- explain to me what this shows.

08:43:53 8 THE WITNESS: It has to do with Dr. Tunnell's analysis.  
08:43:56 9 Dr. Tunnell looked at the data of year-to-year abundance, average  
08:44:01 10 abundance of various fish species and shellfish species; for  
08:44:08 11 example, the two species of shrimp: Brown shrimp and white shrimp.  
08:44:12 12 And he averaged these data, these annual abundances over very large  
08:44:17 13 areas, and then tried to say whether that after -- during and after  
08:44:21 14 the spill the numbers went down. And so the point of this is to  
08:44:25 15 illustrate the areas that he actually used. And the calculation of  
08:44:30 16 averages ranged from, in some cases, the whole Gulf of Mexico, some  
08:44:34 17 cases this large sea map survey which extends from Alabama, the  
08:44:38 18 Florida border to Texas, and, in some cases the whole Louisiana  
08:44:42 19 coastal zone, average those, rather than look specifically at the  
08:44:47 20 abundance changes in the areas that were actually affected.

08:44:52 21 THE COURT: Okay. Insofar as the oil, it looks very  
08:44:58 22 similar to your previous exhibit with --

08:45:05 23 THE WITNESS: The oil is exactly the same. It's the  
08:45:07 24 NOAA --

08:45:08 25 THE COURT: What you're saying is he was -- you're trying

08:45:11 1 to depict visually, I guess, graphically that he, then, compared  
08:45:16 2 that to a much wider universe, so to speak, with --

08:45:20 3 THE WITNESS: Sure. Judge, so if you were going to look  
08:45:23 4 at what the effects of that spill was on populations that were  
08:45:28 5 impacted, it's sort of like if you were -- their approach would  
08:45:33 6 suggest that -- the footprint of the oil suggests the dimensions of  
08:45:39 7 a hurricane. So if that hurricane came ashore, would you have to  
08:45:43 8 devastate the whole Gulf of Mexico in order to claim the harm, or  
08:45:46 9 was it in the area that was affected. And so this analysis averages  
08:45:50 10 data over very large areas rather than concentrates them on data  
08:45:54 11 that represent the area that was actually affected.

08:45:56 12 THE COURT: Okay. I understand. Thank you.

08:45:59 13 MS. ANDRE: Thank you, your Honor.

08:46:01 14 MR. BROCK: I have no objection to this exhibit with this  
08:46:03 15 explanation.

08:46:04 16 THE COURT: All right. Thank you.

08:46:05 17 BY MS. ANDRE:

08:46:06 18 Q. So, Dr. Boesch, you've just discussed how this figure helps  
08:46:11 19 illustrate your criticisms of Dr. Tunnell. Could you also explain  
08:46:16 20 how this map might be helpful to understand your criticisms of  
08:46:20 21 Dr. Shea's approach to the size of the spill?

08:46:23 22 A. Yes. I don't have the -- I think you'll see this from Dr. Rice,  
08:46:28 23 but I don't have all of the samples that were represented in  
08:46:32 24 Dr. Shea's analysis. But Dr. Shea also takes all of the samples  
08:46:36 25 that were collected -- water samples that were collected, and they

08:46:40 1 might have been collected, say, along the Florida shelf -- coast in  
08:46:44 2 anticipation of a baseline information. Or they might have been  
08:46:47 3 taken well after the spill was active just to make sure there was no  
08:46:51 4 oil there.

08:46:51 5                   So you take all of these samples that represent a  
08:46:54 6 lot of water samples where the oil shouldn't have been and wouldn't  
08:46:58 7 have been, and you take the number of samples where you found oil  
08:47:01 8 and say, "Look, isn't it a very small percentage of all of the  
08:47:04 9 samples?" And it's not a reasonable, a transparent and clear  
08:47:10 10 comparison.

08:47:11 11 Q. So now that we've discussed the difference between geographic  
08:47:16 12 areas considered in your report and by BP, let's discuss the extent  
08:47:20 13 of oiling in the Gulf's deepwaters. Have you prepared a slide, a  
08:47:26 14 graphic depiction illustrating deepwater oiling?

08:47:28 15 A. I have.

08:47:29 16 Q. Please call up D-32157A first, what geographic area are you  
08:47:39 17 talking about when you say, "deepwaters"?

08:47:40 18 A. Well, by deepwater environment, if we think of the Gulf of  
08:47:45 19 Mexico, we're familiar with the continental shelf, which is a fairly  
08:47:47 20 flat area that extends out to about 200 meters, and then the bottom  
08:47:52 21 drops off more precipitously. So that area, the deepwater  
08:47:56 22 environment is what we call the continental slope, going from 200 to  
08:48:00 23 2,000 meters. And then, actually, some of the area affected is  
08:48:05 24 formerly what we call the abyss, or abyssal plain, water depths  
08:48:10 25 greater than 2,000 meters. So the consequences, the deepwater

08:48:13 1 consequences on the bottom really affected mostly the continental  
08:48:17 2 slope environments in this area.

08:48:19 3 Q. And what happened to oil and hydrocarbons as they were released  
08:48:23 4 from the well at the bottom of the Gulf?

08:48:25 5 A. Well, this large flow of oil; but, also, importantly, lots of  
08:48:32 6 gas -- for every barrel of oil released there was about 2,000 cubic  
08:48:36 7 feet of gas. Even though I recognize that's out of the equation  
08:48:40 8 with respect to the Clean Water Act issues, that gas has  
08:48:44 9 consequences. It goes into solution and it feeds the microbiota in  
08:48:50 10 the ocean, and, as we'll see, that had some pretty stark,  
08:48:54 11 substantial consequences to the deepwater environment.

08:48:56 12           So as this oil and gas mixture, the gas expanding rapidly,  
08:49:01 13 coming out at high velocity is a lot of mixing that takes place that  
08:49:05 14 breaks the oil into little droplets as well as enhances its solution  
08:49:09 15 into the deepwater. That, interestingly, resulted in what we  
08:49:14 16 generally call the deepwater plume; that is, it rose above the  
08:49:19 17 seabed and it was trapped by the density differences in the water in  
08:49:22 18 the deep Gulf. So between 1,100 meters below the ocean surface and  
08:49:29 19 1,300 meters, that's where this plume existed. And then, the  
08:49:32 20 currents, therefore, could transport that over some fairly large  
08:49:36 21 distances.

08:49:36 22 Q. And are the yellow arrows on this demonstrative, D-32157A, meant  
08:49:42 23 to illustrate the directions in which the deep sea plume moved?

08:49:47 24 A. Not the exact linear course, because the currents ebb and flow  
08:49:52 25 and move around with the bottom topography, but it shows you that

08:49:55 1 the plume into the southwest was detectable as measured by the less  
08:50:02 2 oxygen that one would expect. We can measure this very precisely;  
08:50:06 3 meaning, that there was degradation of the hydrocarbons drawing down  
08:50:09 4 the oxygen, as far away as 300 nautical miles away, well off --  
08:50:15 5 basically off the southwest Louisiana shelf. And then, those  
08:50:19 6 currents also reversed on occasion and moved this deepwater plume up  
08:50:23 7 to -- up into DeSoto Canyon, which is indicated here. The canyon  
08:50:28 8 that kind of starts off in Destin, Florida and goes down into the  
08:50:32 9 deep Gulf.

08:50:3210 Q. How does the deep sea oiling from the Macondo spill differ from  
08:50:3711 oil released in other offshore spills such as Ixtoc?

08:50:4212 A. Well, it's from the deepwater. So Ixtoc or even Santa Barbara  
08:50:4713 spill that occurred off Santa Barbara, California, were fairly  
08:50:5214 shallow water. Ixtoc was 160 feet. So instead of this deepwater  
08:50:5815 plume forming, most of the mass of that oil, actually very quickly,  
08:51:0116 rose to the surface water. Relatively little got mixed in and  
08:51:0517 incorporated into the deepwater environment.

08:51:0818 And although, in one sense, you might think that the  
08:51:1219 incorporation of the deepwater environment is good because it keeps  
08:51:1420 it away from the surface, having that oil go to the surface quickly  
08:51:1721 actually promotes the loss of the hydrocarbons due to evaporation  
08:51:2422 volatilization. So a lot of the compounds that we were now  
08:51:2823 concerned about being toxic in the aquatic environment did not have  
08:51:3124 to go through this phase where they could be evaporated and lost to  
08:51:3625 the ocean.



08:51:36 1 Q. So let's talk about how this deep sea plume impacted what lives  
08:51:41 2 in the deep Gulf. Did you prepare a slide summarizing those  
08:51:44 3 impacts?

08:51:44 4 A. I did.

08:51:45 5 Q. Please call up D-32158. First, which deep sea organisms were  
08:51:54 6 actually harmed by the BP oil spill?

08:51:56 7 A. Well the seabed down there is almost totally mud, so it's the  
08:52:01 8 organisms that live in this muddy bottom. And they would be --  
08:52:03 9 include worms, mollusks, crustaceans that live in the bottom, bottom  
08:52:09 10 sediments. And there was documented reduction in their abundance  
08:52:13 11 and diversity, as well as disruption of the microbial processes that  
08:52:19 12 take place in the bottom sediments.

08:52:21 13 The extent of this was -- of these organisms, these  
08:52:26 14 small animals, the papers that were published indicated that that  
08:52:30 15 area extended over, at least, 57 square miles.

08:52:34 16 Q. How were these organisms impacted by oiling? How did they come  
08:52:41 17 in contact with the oil?

08:52:42 18 A. Well, interestingly, the area that -- the bottom that was  
08:52:47 19 impacted was mostly, for the most part, deeper below this deepwater  
08:52:51 20 plume. So there's a question of how the oil that came out got into  
08:52:55 21 this deepwater plume got to the bottom. And that's now become very  
08:52:59 22 clear that this resulted from what we call biodeposition, deposition  
08:53:06 23 by organisms acted that brought that oil to the bottom. And it's a  
08:53:11 24 phenomenon that we know well in oceanography over the years.

08:53:15 25 It's called marine snow. If you have a lot of biological

08:53:19 1 production by bacteria, the dead bacterial cells, the mucus, so on  
08:53:23 2 that are produced, create almost like a snow in the ocean and that  
08:53:27 3 settles more rapidly. In this case, as those microorganisms grew  
08:53:32 4 with all of the oil and gas that they were feeding on, the snow that  
08:53:36 5 was dense, brought down -- into sediment, it brought down oil to the  
08:53:39 6 seabed and this oily residue which covered the bottom.

08:53:42 7 Q. How did this impact with oil actually harm the species you've  
08:53:47 8 just described?

08:53:48 9 A. Well, in this case, it affected -- fell on the seabed, so if  
08:53:53 10 you're a small organism living in the bottom and you're covered by  
08:53:56 11 this blanket of this residue, it interferes with your ability to  
08:54:00 12 feed and maintain yourself. It could smother them. But also it  
08:54:03 13 exposes those organisms to high concentrations of toxic  
08:54:08 14 hydrocarbons, which are in the residue -- evident in the residue.

08:54:12 15 Q. Now, you also list on this slide that the harm resulting  
08:54:17 16 included disruption of microbial processes. Could you please  
08:54:20 17 explain that?

08:54:21 18 A. Right. So even though they're not -- they don't seem to be  
08:54:25 19 important, these microorganisms that live in the bottom of the ocean  
08:54:28 20 are very important because they regulate the processes by which the  
08:54:33 21 organic matter is degraded and nutrients are recycled into the  
08:54:37 22 water, so that whole process of the ecosystems function.

08:54:41 23 In addition to that, the effect was -- of that is that  
08:54:46 24 because of the degradation of that material, it depletes the oxygen  
08:54:52 25 in the top sediments and, therefore, that shuts off the

08:54:56 1 decomposition. So it allows the oil contaminants to persist longer  
08:55:02 2 in the bottom where they're not subject to dissolution due to  
08:55:07 3 constant mixing of the ocean waters or to degradation by microbial  
08:55:13 4 processes because there's no oxygen left for those process to occur.

08:55:17 5 Q. And do these deepwater species also serve as prey for other  
08:55:21 6 bottom dwelling animals?

08:55:23 7 A. Yes. The animals are important because they are the base of the  
08:55:26 8 food chain for bottom feeding fish, shrimp, for example, that might  
08:55:30 9 live there. In addition, you know, we don't know fully about the  
08:55:40 10 recoverability of these populations. Generally, in the deepwater  
08:55:43 11 environment growth rates are slow, recruitment processes to have  
08:55:49 12 more organisms come in and settle is a slow process. So one thing  
08:55:52 13 we don't yet know because the research hasn't been -- if it's  
08:55:55 14 continued, hasn't been published, is how long this effect will last.

08:55:59 15 Q. Now, let's discuss some of your other conclusions about impacts  
08:56:03 16 in the deep sea. You conclude that deepwater corals were harmed by  
08:56:08 17 the spill. Have you prepared a slide summarizing those conclusions?

08:56:12 18 A. I have.

08:56:12 19 Q. Please call up D-32159. Now, before we talk about the harm that  
08:56:20 20 occurred to these coral, approximately how old were the corals that  
08:56:24 21 were harmed?

08:56:25 22 A. Well, I don't know how old this particular colony is, but the  
08:56:30 23 colonies that have been sampled in this region, living on these  
08:56:33 24 outcrops of the region, have been carbon dated to be more than 400  
08:56:38 25 years old. Again, to put that in context, these corals were just

08:56:41 1 beginning to grow when DeSoto came into the Gulf to explore the  
08:56:45 2 region.

08:56:45 3 Q. And how did oil come into contact with these corals?

08:56:51 4 A. Well, primarily, because of the deposition of this oily residue,  
08:56:56 5 this oily marine snow. And you can see on the far left of -- at  
08:57:03 6 least, on my screen. It's not very clear on the big screen, but on  
08:57:06 7 the screens before us, you'll see how that colony is largely  
08:57:11 8 blanketed by this oily residue. This was in November 2010. So it  
08:57:18 9 is -- it is still about three, four months after the well had been  
08:57:22 10 capped and the oily residue had fallen, and there is still some  
08:57:27 11 coverage of this oily residue on the corals.

08:57:29 12 The other little organism with its tentacles, arms wrapped  
08:57:34 13 around it is a brittle star that lives on -- with these deepwater  
08:57:40 14 corals.

08:57:41 15 So the initial impact is the smothering with this  
08:57:43 16 marine snow, and then, later on, by the end of the year, when this  
08:57:47 17 remarkable series of pictures of the very same colony shows you  
08:57:52 18 how -- where that residue covered them, the tissue, the animals, the  
08:57:56 19 little individual coral polyps were killed, and there was just the  
08:58:00 20 skeleton of the original colony left.

08:58:02 21 Q. And can you briefly explain the difference between cold water  
08:58:06 22 corals that are shown here and other corals in the Gulf that are at  
08:58:10 23 higher depths?

08:58:11 24 A. Yes. One of the presentations -- first of all, the impact on  
08:58:17 25 cold water corals wasn't addressed at all in the round 1 expert

08:58:20 1 reports from BP. They did address, in rebuttal of my original  
08:58:28 2 report on corals, and they tried to, again, minimize it by showing  
08:58:32 3 maps of all of the corals in places that have been known to occur in  
08:58:37 4 the Gulf of Mexico, including shallow water corals. And again, to  
08:58:40 5 my point is that if you want to assess the damage, you should look  
08:58:43 6 at where the effect occurs.

08:58:45 7 I neglected to also say that, as time goes on, you can  
08:58:50 8 see this remarkable series going -- in this last picture is  
08:58:54 9 March 2012, and you'll notice that in the area that the tissue was  
08:58:58 10 damaged there is, now, this fuzzy growth on it. These are colonial  
08:59:02 11 hydroids, another type of colonial marine organism that has come and  
08:59:06 12 occupied the space where the coral polyps used to live, and these  
08:59:10 13 are fast-growing. They don't build new structures like a coral  
08:59:15 14 does. So it's basically inhibiting the recovery of the corals for  
08:59:18 15 at least this, you know, almost two-year period.

08:59:21 16 Q. And where did the harm to these coral occur?

08:59:24 17 A. It occurred at -- documented at three sites in the general  
08:59:31 18 proximity of the wellhead, one being as far as 23 kilometers away.  
08:59:37 19 And generally, as we now know, pulling all of this together,  
08:59:41 20 underneath where this deepwater plume with all of the oil and  
08:59:45 21 dissolved gases and so on and bacterial growth was traveling, that's  
08:59:50 22 depositing over that area. So the colonies that were shallower than  
08:59:55 23 that, above the deepwater plume or well outside where the deepwater  
09:00:00 24 plume was active, weren't affected. It's those in the area where  
09:00:04 25 there was likely exposure that was affected.

09:00:07 1           It's also the case that, because this oily residue comes  
09:00:11 2 down in globs, not uniform blanketing, there are portions of a  
09:00:16 3 colony which are affected and some that are not. Or portions -- or  
09:00:20 4 a colony in one location that is affected and an adjacent colony may  
09:00:24 5 not be. So it's a very patchy effect.

09:00:26 6 Q. With the exception of the fact that animals live in these  
09:00:29 7 corals, which you've already discussed, what are the other important  
09:00:33 8 things to consider in these coral?

09:00:37 9 A. Generally, cold-water corals have been getting a lot of  
09:00:40 10 attention in recent years in marine conservation, and that's because  
09:00:46 11 they live in areas where fishing activities have now began to  
09:00:51 12 extend, trying to fish in deeper areas. So as you can imagine, if  
09:00:56 13 an animal like this, 400 years old, is confronting the trawl, bottom  
09:01:00 14 trawl, it's going to do some significant damage. So there's great  
09:01:04 15 concern about this.

09:01:05 16           And so because of their unique biota and rare occurrence,  
09:01:12 17 only in these little outcroppings in the Gulf, the Department of the  
09:01:15 18 Interior, for example, has requirements that limit oil and gas  
09:01:18 19 drilling activities anywhere near these coral outcroppings. So we  
09:01:23 20 already have a system to try to protect them from the effects of oil  
09:01:28 21 and gas drilling in the Gulf.

09:01:30 22 Q. Now, let's talk about BP's rebuttal to your opinions about  
09:01:34 23 coral. Do you agree that the harm to corals here is insignificant  
09:01:38 24 because only a few corals were harmed?

09:01:40 25 A. Well, I think you can only draw that by comparing it to all of

09:01:46 1 the corals in the Gulf of Mexico. In the areas that were affected,  
09:01:49 2 of course, it's is a significant impact, and there's good  
09:01:51 3 explanation of reasons why, if the corals were shallower, they  
09:01:54 4 wouldn't have been impacted by this. If they were 200 miles away,  
09:01:57 5 they wouldn't have been impacted by this.

09:01:59 6 So again, if we look at where the risk was, harm occurred.

09:02:02 7 Q. And what is your opinion of Dr. Shea's dismissal of the marine  
09:02:07 8 snow phenomenon?

09:02:08 9 A. He said that this idea of oily marine snow is highly  
09:02:14 10 speculative, and I can only say he hasn't followed the literature or  
09:02:18 11 the debate among the scientists. The concept of marine snow has  
09:02:22 12 been around for almost 100 years and has been extensively studied.  
09:02:27 13 The difference here is that the evidence that this marine snow that  
09:02:31 14 was created was, first of all, more of it was created because of all  
09:02:36 15 of the hydrocarbons put into the environment; but also that it  
09:02:39 16 trapped oil. But there is no real debate about it among the active  
09:02:44 17 scientific community that studied this phenomenon.

09:02:48 18 Q. Did BP provide any alternative theories for how the harm shown  
09:02:51 19 in these pictures might have occurred?

09:02:53 20 A. Yes. They suggested that, both in their reports as well as a  
09:02:59 21 paper that was critiqued that was published -- that this could  
09:03:03 22 result from natural oil seeps in the area.

09:03:05 23 Q. Did they also conclude that this was not Macondo oil because it  
09:03:09 24 had not been fingerprinted?

09:03:11 25 A. Yes. They criticized the papers that came out originally

09:03:16 1 describing this phenomenon that it had done some chemical analyses  
09:03:20 2 that were more of an indicator, -- key indicators to indicate that  
09:03:26 3 that was recent fresh oil and they criticized it as not doing the  
09:03:30 4 full spectrum scan.

09:03:32 5           The challenge though, of course, is that if there was  
09:03:35 6 natural seeps that could be affecting these, I don't know how the  
09:03:37 7 corals would have survived all of this time in an area where there  
09:03:41 8 are natural seeps. And also, there's very clear evidence of this  
09:03:45 9 blanketing of a large area of this oily residue of the scale,  
09:03:50 10 amount, and geographic scale that makes the suggestion that it's oil  
09:03:56 11 seeps, natural oil seeps kind of fall on its own merit.

09:04:00 12 Q. Now, did BP offer any other opinions regarding the impact of  
09:04:05 13 natural seeps in the Gulf?

09:04:07 14 A. Yeah. They, again, tried to look at some other source of  
09:04:14 15 contamination, talked about natural seeps. They referred to the  
09:04:17 16 fact that the National Academy of Science report suggested in its  
09:04:21 17 estimate of trying to understand the amount of natural oil -- oil  
09:04:26 18 seeping into the Gulf of Mexico from natural oil seeps, that it  
09:04:31 19 could be 1500, 3600 barrels a day. But that's across the whole  
09:04:37 20 Gulf, that's not one seep. The actual individual seeps are more  
09:04:42 21 like -- even a very active one is maybe ten barrels a day.

09:04:45 22 Q. Approximately how many natural seeps are there in the Gulf of  
09:04:50 23 Mexico?

09:04:50 24 A. I don't know. I think there are certainly hundreds. On the  
09:04:55 25 continental slope, natural oil seeps if not thousands. And they



09:04:59 1 range in size from seeps that show small bubbling of gas to those  
09:05:07 2 that are almost like a lava light releasing globules of oil.

09:05:14 3 Q. Do you have a demonstrative prepared to illustrate the  
09:05:18 4 difference between discharge from a seep from the Macondo well,  
09:05:22 5 and -- I'm sorry. Let me say that again.

09:05:24 6 Do you have some exhibits that you brought to illustrate  
09:05:28 7 the difference between discharge from a seep and discharge from the  
09:05:32 8 Macondo well after the blowout?

09:05:34 9 A. Yes. We have a videos which compare the two, both a natural  
09:05:38 10 seep as well as the blowout.

09:05:39 11 Q. Thank you.

09:05:39 12 MS. ANDRE: Can we first pull up TREX 233579.

09:05:39 13 BY MS. ANDRE:

09:05:46 14 Q. What are we looking at here, Dr. Boesch?

09:05:48 15 A. This is a video of a natural seep in the Gulf. And it is --  
09:05:54 16 I've looked at number of videos of seeps, natural seeps, and this is  
09:05:58 17 actually one of the most active that I've seen. As you can see,  
09:06:00 18 it's releasing bubbles of gas, but also some globules of oil. And  
09:06:06 19 just to put this in scale, I would say the width of that area, that  
09:06:11 20 fissure in which there is a seep going on, maybe oh, a foot or so, a  
09:06:17 21 small area. And you'll also see that, although there is some mixing  
09:06:21 22 as the oil rises, it's basically ascending. And if you were at the  
09:06:29 23 surface, anywhere near one of these natural seeps, you really  
09:06:32 24 wouldn't see an oil slick. Sometimes you can see them from  
09:06:36 25 satellite images and so on as a sheen. But it's not something that

09:06:42 1 produce a large floating mass of oil on the surface either.

09:06:45 2 Q. Let's compare this video to the Macondo well. Could you please  
09:06:49 3 pull up TREX 233557.

09:06:59 4 A. So here is the Macondo well just on June 3rd, 2010, the day in  
09:07:04 5 which the lower marine riser was cut off of the top. Remember, that  
09:07:09 6 kind of crimped the flow and resulted in the flow coming from  
09:07:14 7 several places along the riser. This is the total flow from the  
09:07:17 8 well at that time. And the width, again -- the scale is different  
09:07:22 9 so the width of that diameter of that riser or the head of the well  
09:07:30 10 here is about 3 feet.

09:07:32 11 And you can see this is no seep, it's a gushing mass of  
09:07:36 12 gas and oil coming out at high velocity. You can get a sense of the  
09:07:41 13 mixing that takes place as a result of that. That's a process which  
09:07:44 14 allows for greater entrainment of oil into the deep waters of the  
09:07:50 15 Gulf.

09:07:51 16 Q. Do these videos tell you anything else about the comparative  
09:07:55 17 effects of the Macondo blowout and natural seeps?

09:07:57 18 A. Yes. These natural seeps have been studied for quite a bit, and  
09:08:03 19 they do have biological effects on the sea floor near the seeps.

09:08:10 20 There are various organisms that -- microbes, in particular, that  
09:08:15 21 actually feed on the oil coming out of those seeps and change  
09:08:17 22 conditions. But generally those effects are noted over a period of  
09:08:22 23 maybe ten meters, less than 100 meters or so. And of course, in  
09:08:27 24 this case, because we have this oil coming up creating this  
09:08:29 25 deepwater plume, that allows for greater effect over a larger, much

09:08:34 1 larger area.

09:08:36 2 MS. ANDRE: Thank you. You can take those videos down.

09:08:36 3 BY MS. ANDRE:

09:08:39 4 Q. Let's shift our focus now to the subject of the impact on the  
09:08:42 5 near-surface waters.

09:08:43 6 First, when you discuss "near-surface water," what depth  
09:08:46 7 are you referring to?

09:08:47 8 A. Well, those depths in which there's mixing with the surface, so  
09:08:51 9 generally speaking, within 10 meters. There is effects depending  
09:08:56 10 upon the amount of wind conditions that can mix it down to  
09:09:01 11 30 meters. But I think the conditions we're concerned about seeing  
09:09:03 12 effects from floating oil are confined to the top few meters, not  
09:09:06 13 more than 10 meters.

09:09:07 14 Q. And have you prepared a slide summarizing impacts from oiling on  
09:09:11 15 the near surface?

09:09:12 16 A. Yes, I have.

09:09:14 17 Q. Please call up D-32160. First, what types of organisms were  
09:09:24 18 harmed in the near-surface waters?

09:09:25 19 A. Well, from a variety of papers that have been published as  
09:09:29 20 evidence of harm of a number of the kinds of organisms that we find  
09:09:33 21 in plankton, including phytoplankton, that is the small plants which  
09:09:38 22 photosynthesize because of the light ability and support the basis  
09:09:42 23 of the food chain. But also the microbes that are involved in  
09:09:46 24 recycling of materials and nutrients, bacteria.

09:09:48 25 But also the other things we're more familiar with, small

09:09:51 1 planktonic crustaceans, as well as comb jellies and jellyfish and  
09:09:58 2 protozoans which live in the surface water.

09:10:00 3 Q. And how did oiling impact these organisms?

09:10:03 4 A. The evidence is from a number of papers and sources, and they  
09:10:08 5 include evidence that the carbon -- that is, the organic matter  
09:10:14 6 that's in oil -- was incorporated into food chains. In fact -- and  
09:10:17 7 being exchanged from one level to another.

09:10:19 8           So that doesn't address the toxicity itself, but it  
09:10:25 9 basically says the whole basis of how food is provided and  
09:10:28 10 distributed through the system was altered. So it fits my  
09:10:32 11 definition by saying this is an alteration of a natural function of  
09:10:35 12 an ecosystem.

09:10:37 13           Secondly, there's evidence that for some of these animal  
09:10:41 14 plankton, that there is evidence that there was bioaccumulation,  
09:10:46 15 actually PAHs, polycyclic aromatic hydrocarbons, almost certainly  
09:10:52 16 from that source, the Macondo well source, that had been taken up by  
09:10:56 17 the organisms, a key part of their exposure to the toxins.

09:11:02 18           And then in addition to that, there is experimental  
09:11:04 19 evidence from laboratory studies that have exposed planktonic  
09:11:11 20 organisms in various concentrations of this Macondo well oil that  
09:11:16 21 basically indicates that these exposure conditions were sufficient  
09:11:20 22 to have induced a toxic effect.

09:11:23 23 Q. Can you give some examples of what animals that feed on these  
09:11:26 24 organisms?

09:11:26 25 A. Yes, these organisms are very critical, for example, to support

09:11:32 1 another important organism we'll than talk about, the larvae of fish  
09:11:38 2 that, because of the availability of food source and how that allows  
09:11:42 3 their dispersal, they tend to aggregate up near the surface of the  
09:11:46 4 ocean. And as they develop and they begin their first feeding,  
09:11:49 5 they're feeding on these plankton that -- and they're abundance and  
09:11:54 6 availability of that nutritious food source is critical to their  
09:11:57 7 survival.

09:11:58 8 Q. Let's discuss your conclusions regarding impact to fish in more  
09:12:03 9 detail. Have you prepared a slide summarizing those impacts?

09:12:06 10 A. I have.

09:12:07 11 Q. Please call up D-32161. As an initial matter, where were Gulf  
09:12:16 12 fish impacted by the BP oil spill?

09:12:19 13 A. Well, again, where there was high concentration of oil. That  
09:12:25 14 included near the surface in these near-surface waters. And we  
09:12:27 15 review evidence that suggests that there is a clear potential for  
09:12:31 16 harm of larvae, of ocean fish, such as bluefin tuna, yellowfin tuna,  
09:12:41 17 Mahi Mahi, and greater Amberjack. And that are at the near-surface  
09:12:46 18 waters, just as I described.

09:12:48 19 And then there's also this issue of potential harm to the  
09:12:51 20 bottom-dwelling fish that I described in addressing Judge Barbier's  
09:12:58 21 question about PAH concentrations in the liver and bile, as well as  
09:13:06 22 the skin lesions.

09:13:07 23 Q. And which species of bottom-dwelling fish were potentially  
09:13:11 24 impacted by the spill?

09:13:12 25 A. Well, scientists who published the paper identified three

09:13:36 1 species, red snapper -- and I am not talking about -- you'll hear  
09:13:36 2 some more evidence about red snapper populations over the whole  
09:13:36 3 region of the Gulf. I'm talking about the portion of their  
09:13:36 4 populations which is in the outer most shelf that is exposed to  
09:13:36 5 where the -- where there is evidence and potential for sediment  
09:13:36 6 contamination. Northern hake, another species a little bit more  
09:13:39 7 intimately in contact with the seabed. The red snapper might get  
09:13:44 8 down and swim around above the bottom, but these fish live --  
09:13:48 9 doesn't get off the bottom very much. And then tile fish, which  
09:13:51 10 actually is a fish that actually creates burrows into the seabed.  
09:13:54 11 So it's intimately exposed with the sediment.

09:13:56 12 Q. I want to go back up for a moment to the oceanic fish harm that  
09:14:03 13 you described. Is this a topic that Dr. Rice is going to discuss in  
09:14:06 14 much more detail?

09:14:07 15 A. Yes, he will. He will describe how the evidence -- experimental  
09:14:13 16 evidence that's now been published, that the embryos and developing  
09:14:19 17 larvae have various impairment of functions, heart development  
09:14:25 18 functions, as well as formation of fins that -- in ways that could  
09:14:32 19 effect their survival at concentrations roughly in the  
09:14:38 20 part-per-billion range just to put this in context. Part per  
09:14:41 21 billion is like one drop of this compound -- these compounds over  
09:14:47 22 300 barrels of sea water. So it's very low concentrations. And  
09:14:51 23 that's the main subject of the source of debate that the Court will  
09:14:55 24 be hearing between the experts about whether those effects could  
09:15:00 25 have occurred.

09:15:01 1 MR. BROCK: Your Honor, I object and move to strike that  
09:15:03 2 response. He is testifying to what Dr. Rice will testify to. And  
09:15:07 3 he will be here later today for examination.

09:15:10 4 THE COURT: Well, he really just, I think, gave the topic  
09:15:15 5 that Dr. Rice says he will be testifying about; he didn't say what  
09:15:20 6 Dr. Rice's opinions would be.

09:15:22 7 MR. BROCK: If you heard it that way, I am satisfied with  
09:15:25 8 that. If it's description of the topic, but I thought he was  
09:15:28 9 advocating a position.

09:15:30 10 THE COURT: He said Dr. Rice will testify about this;  
09:15:33 11 we'll hear Dr. Rice testify about it.

09:15:33 12 BY MS. ANDRE:

09:15:36 13 Q. And to be clear, Dr. Boesch, did you review all of the papers in  
09:15:41 14 consideration of your Round report that Dr. Rice will be discussing  
09:15:44 15 later today?

09:15:44 16 A. The papers that deal specifically about the effects of pHs  
09:15:52 17 coming from this oil on these species of fish, I did review. I did  
09:15:59 18 not review all of the -- Dr. Rice has covered a far greater body of  
09:16:03 19 literature covering other evidence of these kinds of exposures. I  
09:16:07 20 didn't review all of those, but certainly these papers I read very  
09:16:10 21 carefully.

09:16:10 22 Q. And as you already testified, you independently reviewed and  
09:16:13 23 adopted the opinions of Dr. Rice expressed in your joint round 2  
09:16:18 24 report, correct?

09:16:19 25 A. I have.

09:16:19 1 Q. Now, Dr. Boesch, could the harms that you just described impact  
09:16:26 2 populations of these fish?

09:16:28 3 MR. BROCK: Your Honor, I am going to object to the  
09:16:30 4 question as describing it as "harm." If we're still on potential  
09:16:34 5 harms, I think we should make that clear, please. That's my  
09:16:37 6 objection.

09:16:38 7 THE COURT: All right. I think I'll overrule the  
09:16:40 8 objection. The witness can, I think, explain. I think he's done a  
09:16:44 9 pretty good job of differentiating through his testimony.

09:16:47 10 Go ahead.

09:16:49 11 THE WITNESS: Well, this is why I labeled it "potential  
09:16:52 12 harm," because I don't know whether this affected the survival of  
09:16:56 13 these larvae in the real world. The evidence suggests that, at  
09:17:02 14 those concentrations which could be realized, that there was  
09:17:07 15 impaired heart function, development, that it affected how the fins  
09:17:12 16 were being formed.

09:17:14 17 And my part of the analysis is that I am an ecologist, so  
09:17:20 18 I am not into the detail of the toxicology. But from the ecological  
09:17:24 19 perspective of what I know about the conditions of survival of  
09:17:27 20 larvae in the surface of the Gulf of Mexico, an impaired larvae that  
09:17:33 21 can't -- that its heart is beating too fast or its fins aren't being  
09:17:39 22 formed or the swimming speed is impaired is not likely to survive  
09:17:43 23 because it is really a "fish eat fish" world there. So any kind of  
09:17:47 24 impairment like this, and even though it might not result in the  
09:17:51 25 immediate, observable mortality, makes their survival in nature that



09:17:55 1 much more difficult a challenge.

09:17:55 2 BY MS. ANDRE:

09:17:59 3 Q. Now, BP's expert, Dr. Tunnell, offers opinions about harm to  
09:18:03 4 fish and shellfish populations. Have you prepared a slide  
09:18:07 5 summarizing your criticisms of Dr. Tunnell's work?

09:18:10 6 A. I have.

09:18:10 7 Q. Please call up D-32162. First, what is your opinion of the  
09:18:19 8 species considered by Dr. Tunnell?

09:18:21 9 A. Well, remember the slide where I showed you the scope of the  
09:18:23 10 activities Dr. Tunnell had used in the Gulf of Mexico, those dealt  
09:18:29 11 with data that mainly were on coastal species, species that were  
09:18:34 12 even living in the estuaries or in the shallow continental shelf  
09:18:38 13 that were surveyed. So he didn't address the two groups of species  
09:18:42 14 that I found that there was probable harm; that is the deep  
09:18:46 15 continental shelf, living near the seabed, those fish, or the  
09:18:52 16 surface larvae of these pelagic fish. So he doesn't discuss either  
09:18:58 17 of those kind of species. And rather, his focus and his analysis  
09:19:02 18 are on species which I haven't found such evidence yet to raise to  
09:19:06 19 the level of potential harm, given the conservative approach I took.

09:19:10 20 Q. Now, Dr. Tunnell did consider in his analysis red snapper  
09:19:14 21 populations, did he not?

09:19:15 22 A. He did. But he took averages over the whole shelf. And again,  
09:19:19 23 as I said, I think, where these red snapper populations were likely  
09:19:23 24 exposed and certainly where the skin lesions and the bio  
09:19:28 25 accumulations was noted, was in the deeper shelf, which was not an

09:19:31 1 area actually sampled in these surveys.

09:19:33 2 Q. Please explain your criticism of the geographic area Dr. Tunnell  
09:19:38 3 considered. You've already mentioned it to the Court; is there  
09:19:42 4 anything you want to add?

09:19:43 5 A. No, I think I pretty well covered it. Although I would say: In  
09:19:47 6 the third report, he did take a look at more limited area, took part  
09:19:54 7 of the sample universe in, say, looked, for example, at southeast  
09:20:01 8 Louisiana as opposed to the whole coastal Louisiana or as opposed to  
09:20:05 9 the southwestern Gulf of Mexico, which I think was a step in the  
09:20:07 10 right direction. However, we can -- hopefully, we'll talk about  
09:20:11 11 some of the limitations of that statistical analysis.

09:20:15 12 And these populations are highly variable, so it's very  
09:20:19 13 difficult from those kind of broad brush data to draw these  
09:20:23 14 conclusion.

09:20:23 15 Q. Let's talk about his statistical methods. What about them did  
09:20:27 16 you find inappropriate?

09:20:28 17 A. Well, they were just not up to the standard that one could  
09:20:32 18 expect in contemporary fishing science and I don't think would  
09:20:37 19 survive peer review in a quality journal, for a variety of reasons.  
09:20:42 20 Starting with the reason of, if one is trying to find an effect in a  
09:20:50 21 population that's going to be highly variable from year to year,  
09:20:54 22 it's going to be difficult because of that variance, right? And  
09:20:59 23 that -- so then to address that, he converts these data to the log  
09:21:07 24 ten of the abundance. So right away, one unit in his graph is a  
09:21:12 25 factor of 10, so he can only see really big differences.

09:21:16 1           And what one normally does this, sort of the standard in  
09:21:22 2 analysis of this, is that you're required to do a power analysis.  
09:21:25 3 What is the power of the test? What kind of effect could you  
09:21:30 4 possibly detect given that variance? And he doesn't attempt to do  
09:21:32 5 that.

09:21:33 6 Q. Did his statistical methods have other shortcomings?

09:21:36 7 A. Yes. One of the things that's also generally required if you're  
09:21:39 8 talking about the changes over time of a fish population, you have  
09:21:43 9 to take into account the other things that affect that population.  
09:21:46 10 So we know that climate variability, whether it's a wet year or a  
09:21:50 11 dry year, cold winter or not, that's going to effect the population.  
09:21:55 12 So in order to see an effect of a stressor -- in this case, the oil  
09:21:59 13 spill -- you have to account for that effect as well as your stress  
09:22:03 14 effect. And he didn't attempt to do that at all.

09:22:06 15 Q. Now, in your report, you also criticize his use of regression  
09:22:10 16 modeling. Can you please explain that?

09:22:13 17 A. Right. Regression modeling, quite simply put, is if you have a  
09:22:16 18 number of data points over say 10 or 11 years and you try to draw a  
09:22:22 19 best fit line that describes that trend, and that's what he did. He  
09:22:26 20 then said, Okay. I am going to compare the abundances after the  
09:22:30 21 spill to that line.

09:22:32 22           The problem was he uses the abundances after the spill to  
09:22:37 23 help compute that line. So it's like defining the trend based upon  
09:22:41 24 the observations you're trying to compare to the regression. It's  
09:22:45 25 sort of an undergraduate mistake in statistics.

09:22:49 1 Q. Now, why did Dr. Tunnell's failure to adhere to contemporary  
09:22:54 2 standards in his statistical methods matter from ecological point of  
09:23:00 3 view?

09:23:00 4 A. Well, from ecological point of view, one has to take into  
09:23:06 5 account the other factors that affect the populations in order to  
09:23:10 6 understand the effect, quantify the effect one is looking for. So  
09:23:15 7 there could well be very meaningful effects of the population level  
09:23:22 8 that are obscured by his analysis for the failings that I've already  
09:23:27 9 described.

09:23:27 10 Q. Is there any peer-reviewed literature cited both by yourself and  
09:23:32 11 Dr. Tunnell regarding fish populations?

09:23:34 12 A. Yes. There is a paper, which I think is very important paper,  
09:23:37 13 that -- by Fodrie and colleagues that addresses this challenge one  
09:23:43 14 has. When you can measure effects of the individual level like, you  
09:23:52 15 know, effecting growth rate or effecting their ability to regulate  
09:23:56 16 their physiological conditions, and how does that -- how you can  
09:24:01 17 reconcile measurements at the population level and the challenge  
09:24:06 18 scientists have of bringing those together. And that's the paper  
09:24:08 19 that we both cite.

09:24:10 20 Q. Let's call that paper up, please, TREX 231543. For the record,  
09:24:23 21 this paper is entitled "Integrating Organismal and Population  
09:24:28 22 Responses of Estuarine Fishes in Macondo Spill Research."

09:24:32 23 This is the paper you were just referencing, isn't it,  
09:24:35 24 Dr. Boesch?

09:24:35 25 A. Yes, indeed. And you can see the authors -- you don't know them

09:24:38 1 but I know many of these folks and they include ecologists, fish  
09:24:42 2 biologists, and molecular toxicologists, sort of a synthesis of the  
09:24:49 3 information available.

09:24:49 4 Q. And how does Dr. Tunnell's reliance on this article differ from  
09:24:53 5 your own?

09:24:54 6 A. Simply, he uses it and takes a quote out of it saying that  
09:24:59 7 population level effects haven't been found. But he doesn't then,  
09:25:04 8 honestly, bring in the rest of the paper which discusses why that  
09:25:07 9 might be the case.

09:25:09 10 Q. Let's shift our focus now and discuss impacts to plants and  
09:25:13 11 animals that live on or near the surface of the Gulf. Did you  
09:25:17 12 propose a slide summarizing impacts to surface plant life?

09:25:20 13 A. I have.

09:25:21 14 Q. Please call up D-32163. What species of floating seaweed were  
09:25:30 15 harmed by the spill?

09:25:31 16 A. Well, there are two species in the genus Sargassum, the brown  
09:25:37 17 alga that, if you've been offshore in the Gulf here or off the  
09:25:40 18 Atlantic coast, you're familiar with these exploding masses of brown  
09:25:44 19 algae out in the open waters. And they are species that are adapted  
09:25:47 20 to live their full lifetime in that condition. So that's why the  
09:25:53 21 Sargasso Sea is named the Sargasso Sea because of the floating  
09:25:57 22 Sargassum.

09:25:57 23 So the same organisms occur in the Gulf. And what  
09:26:02 24 happened in the area where there was heavy flowing of oil is that --  
09:26:04 25 there's both observational and experimental evidence to show that,

09:26:07 1 when the oil was incorporated into these floating seaweed masses,  
09:26:12 2 the seaweed sunk. It probably has to do with the small bladders  
09:26:16 3 that -- the gaseous bladders that the seaweeds have to keep them  
09:26:20 4 floating. Those were interfered with and they basically sunk to the  
09:26:23 5 bottom. So the surveys showed there were remarkable dearth of  
09:26:27 6 seaweeds in the areas that were -- where there was a lot of floating  
09:26:31 7 oil.

09:26:31 8 Q. And did this impact also result in oxygen depletion in these  
09:26:36 9 areas?

09:26:37 10 A. The sinking seaweeds probably didn't, the oxygen conditions; but  
09:26:45 11 the studies that have been done also suggested that, in addition to  
09:26:49 12 the loss of habitat of the animals that depend on the floating  
09:26:53 13 seaweed -- hopefully we'll talk about them -- they also -- this oil,  
09:26:58 14 as it was mixed in with the seaweed, is degrading and so the oxygen  
09:27:02 15 levels in the environment within the seaweed was depressed to the  
09:27:06 16 point of being stressful to -- if the seaweed was surviving, it was  
09:27:11 17 still a stressful place to live.

09:27:12 18 Q. What is the importance of sargassum?

09:27:16 19 A. There are very interesting organisms that are associated with  
09:27:20 20 sargassum that are only found in sargassum, but from our  
09:27:23 21 perspective, they are really important as a refuge, a habitat where  
09:27:28 22 as you can see schooling fish will kind of hide and protect  
09:27:30 23 themselves. And also importantly, young, very young sea turtles  
09:27:37 24 will seek sargassum and kind of hang out and hide in them because it  
09:27:42 25 provides them food but also a refuge from predators. And as the

09:27:48 1 seaweed, sargassum, is mixed in with the oil, as the bottom  
09:27:52 2 photograph would suggest, this produces considerable stress to those  
09:27:57 3 organisms that are associated with the sargassum mats.

09:28:00 4 Q. And where would these reductions in sargassum observed?

09:28:06 5 A. The studies that were done showed the -- documented the  
09:28:09 6 reduction of abundance in the areas east of the Delta, Mississippi  
09:28:14 7 Delta. So from the Chandeleur Islands to the Florida panhandle.  
09:28:17 8 That was the area that was surveyed.

09:28:19 9 Q. And is the harm to these floating seaweed communities ongoing?

09:28:22 10 A. Well, it seems that the seaweed populations have recovered, have  
09:28:27 11 come back. And that this is -- you know, it floats around, it can  
09:28:36 12 be repropagated and be recolonized this area, which is good, but we  
09:28:41 13 don't know, of course, what the consequence of the animals  
09:28:44 14 associated with this, whether the sea turtles, whether that's had a  
09:28:48 15 long-term effect on the populations or exposed individuals or  
09:28:52 16 classes of fish that might have been interfered with. So in that  
09:28:55 17 context, I can't tell you that there's no long-term consequence.

09:28:57 18 Q. Let's discuss turtles and a couple of other animals living on or  
09:29:02 19 near the surface of the Gulf. Which other animals living near the  
09:29:07 20 Gulf surface were impacted by the BP oil spill?

09:29:10 21 A. The ones that we talked about, the seaweeds, and then plankton,  
09:29:19 22 that would include the fish larvae and the like.

09:29:22 23 Q. And what air breathing animals were impacted?

09:29:24 24 A. Oh, I'm sorry. I covered those before. So as I mentioned in  
09:29:28 25 the introduction, the air breathing animals, birds that have to

09:29:35 1 traverse the surface to feed, and -- or at the surface swimming  
09:29:41 2 around, and marine mammals, particularly bottlenose dolphins in this  
09:29:47 3 case, as well as sea turtles which have to go to the surface to  
09:29:50 4 breathe, are particularly susceptible -- well-known to be  
09:29:53 5 susceptible to oil spills.

09:29:54 6 Q. Now, earlier in your testimony you mentioned that one of the  
09:29:58 7 sources of data you reviewed was a table summarizing animals  
09:30:03 8 collected during the response.

09:30:04 9 A. Yes. As I said, there's been -- relative to a lot of other  
09:30:09 10 areas that I've talked about, there hasn't been a large number of  
09:30:12 11 papers that have been published in the peer-reviewed literature.  
09:30:18 12 Possibly -- probably, because a lot of the information and analysis  
09:30:20 13 is tied up in the Natural Resources Damages case. But there are --  
09:30:24 14 the government has released general summary tables of, for example,  
09:30:29 15 strandings of birds and mammals and turtles on beaches and their  
09:30:34 16 collections of these animals during and after the spill.

09:30:37 17 Q. Now, let's call up one of these data sources, which are -- I'll  
09:30:42 18 warn your Honor in advance is impossible to read, so we have a table  
09:30:46 19 directly following it that is much clearer. The TREX is 231360.

09:30:55 20 Is this one of the tables that you relied upon?

09:30:57 21 A. Yes. This is the so-called "Consolidated Collection Table,"  
09:31:02 22 fish and wildlife collection report that summarizes the collections  
09:31:07 23 made by various agencies.

09:31:08 24 Q. And let's pull up the slide containing some of the numbers from  
09:31:13 25 this table, please. D-32164. So, please, explain this table to the



09:31:20 1 Court.

09:31:20 2 A. Yes, so this summarizes that larger table. It shows you for  
09:31:25 3 birds, sea turtles, and mammals with that differentiation of species  
09:31:30 4 at this point. The total numbers that were collected live; of  
09:31:33 5 those, the numbers that were visibly oiled. The numbers collected  
09:31:37 6 dead; and of those, those that were visibly oiled. Those reflect  
09:31:41 7 both the data from rescue efforts where they were going out and  
09:31:44 8 trying to collect oiled birds or remove sea turtles from harm, as  
09:31:52 9 well as strandings; that is, collections of dead animals washed up  
09:31:55 10 on the beach or oiled animals similarly washed up on the beach.

09:31:59 11 Q. And what date was this table produced?

09:32:02 12 A. This are the results through April 14th, 2011.

09:32:06 13 Q. Would you say that this table is a complete summary of every  
09:32:10 14 turtle, dolphin, or bird injured by the BP oil spill?

09:32:14 15 A. Not in the least. Because of the vastness of the size of the  
09:32:19 16 area and so on, and extensive areas offshore, there had to be many  
09:32:23 17 more casualties of this that were never collected, rescued, or  
09:32:29 18 carcasses of which were never collected. This is actually  
09:32:32 19 well-known from previous studies of oil spills.

09:32:36 20 Q. Let's discuss impacts to these animals in more detail, starting  
09:32:41 21 with turtles. Have you created a slide summarizing harm to turtles?

09:32:45 22 A. I have.

09:32:46 23 Q. Please call up D-32165. What direct evidence was there of harm  
09:32:56 24 to turtles caused by the BP oil spill?

09:32:58 25 A. Well, first of all. There are five species of sea turtles in

09:33:03 1 the Gulf, all of which are threatened or endangered, so they're a  
09:33:08 2 special concern. Not only from a concern in terms of, you know,  
09:33:12 3 their survival, but in the context of understanding population level  
09:33:16 4 effects. Since their populations are depressed anyway, any effect  
09:33:19 5 has to be seriously considered.

09:33:21 6           And there were the -- as the previous table showed,  
09:33:28 7 there were 1,149 turtles that were collected during the response.  
09:33:33 8 Some of those were oiled turtles, like the picture on the bottom  
09:33:38 9 right, that were rescued, cleaned up, and rehabilitated. Released  
09:33:43 10 elsewhere. Others were carcasses. So that's the general total of  
09:33:52 11 animals that were collected.

09:33:55 12           In addition to that, the response went out to try to  
09:33:59 13 protect this resource by locating nests on beaches that they thought  
09:34:03 14 could be affected by the oil spill. And then, preemptively going in  
09:34:08 15 and removing the eggs from those nests to take them out of harm's  
09:34:11 16 way. And what those were done, that resulted in the transport of  
09:34:16 17 almost 15,000 hatchlings of little turtles that were, then,  
09:34:22 18 transported and released from beaches in Florida.

09:34:26 19           In addition to that, the evidence is this issue of the  
09:34:29 20 lost habitat, sargassum, which is a really important habitat for  
09:34:33 21 little small turtles; particularly, Kemp's Ridley turtles living, as  
09:34:38 22 this one does in the top right here, out, in association with the  
09:34:42 23 sargassum.

09:34:43 24 Q. Now, relevant to the hatchling relocation program you just  
09:34:46 25 mentioned, were those hatchlings released on Florida beaches on the

09:34:52 1 Atlantic Coast?

09:34:53 2 A. Yes, they were released on the Atlantic Coast. I think it's  
09:34:56 3 unknown the degree to which those turtles -- any of those turtles  
09:35:00 4 will return to the Gulf of Mexico. So although it was a great  
09:35:06 5 effort to mitigate the mortality of these individual animals from a  
09:35:11 6 Gulf of Mexico population standpoint, it might not have been all  
09:35:15 7 that helpful. We don't know yet, and I think there's -- some of  
09:35:19 8 that may be unknowable, but there are studies trying to address that  
09:35:22 9 question.

09:35:22 10 Q. Now looking at this slide, the bottom photo you just mentioned  
09:35:26 11 as an example of a turtle that was probably rehabilitated and  
09:35:31 12 re-released. Would you expect that had this turtle not been  
09:35:35 13 collected by response workers it wouldn't survive?

09:35:37 14 A. This turtle -- I think it's just hard to imagine that that  
09:35:40 15 turtle would survive. And, of course, there are other turtles with  
09:35:44 16 less oiling that could have survived, but there were some of these  
09:35:48 17 small turtles which are, obviously, affected and, apparently, in the  
09:35:52 18 effort to try to rescue them. My point is that this -- as laudable  
09:35:57 19 as it was, this could only affect the rescue of a small percentage  
09:36:00 20 of the population of turtles out there in the large expanse of the  
09:36:06 21 Gulf.

09:36:06 22 Q. Let's talk about other indicators of harm that you considered in  
09:36:09 23 your assessment. What are those?

09:36:11 24 A. Well, as I said, the exposure of juveniles and hatchlings to the  
09:36:16 25 sargassum. In addition to that, there was a substantial increase in

09:36:18 1 the stranding rate; that is the number of dead turtle carcasses  
09:36:22 2 found during 2010 compared to the historical rates. So the  
09:36:28 3 five-fold increase in the stranding rates that were observed.

09:36:33 4 And up to an eight-fold increase in the stranding rates  
09:36:37 5 during the months in which it was active amount of -- substantial  
09:36:41 6 amount of oil out there.

09:36:42 7 Now, it is likely that because there were more people  
09:36:48 8 out there in the response effort, there were more observers, more of  
09:36:52 9 the dead turtles, stranded turtles were found than would normally be  
09:36:56 10 the case. But one would have to assume that it's eight times more,  
09:37:00 11 you know, we've only caught one-eighth of the turtles before, but  
09:37:05 12 now we're getting eight times more just because of observers. And I  
09:37:10 13 think that's hard to believe, and I think they may have some  
09:37:13 14 evidence to suggest that that was the primary factor.

09:37:15 15 And so as I said, as we'll discuss more with birds,  
09:37:20 16 there's a large experience with the fact that in any of these kinds  
09:37:26 17 of incidents that you're likely to only collect a portion of the  
09:37:31 18 animals that were actually affected.

09:37:33 19 And in addition to that, there was this effect --  
09:37:36 20 potential effect, as we talked earlier about the effects on the  
09:37:39 21 nesting habitat, which, again, it was mitigation to try to reduce  
09:37:43 22 that, but not necessarily clear benefits to the Gulf populations.

09:37:47 23 Q. Let's move on to dolphins. Did you create a slide summarizing  
09:37:51 24 harm to dolphins?

09:37:52 25 A. I have.

09:37:53 1 Q. Please call up D-32166. How were dolphins actually harmed by  
09:38:03 2 the BOP oil spill?

09:38:04 3 A. Well, dolphins, again, having to travel through and breathe the  
09:38:09 4 air around these floating oil were exposed. And in addition to  
09:38:16 5 that, there were 170 dolphins that were collected during this  
09:38:23 6 period -- I'm sorry, during the response period.

09:38:26 7 And in addition to that, there is a study that was  
09:38:33 8 conducted in Barataria Bay here in Louisiana with a resident  
09:38:38 9 population of bottlenose dolphin, which was unlike the other kinds  
09:38:42 10 of evidence, which was either dead bodies washed up on the beach or  
09:38:48 11 necropsy, you know, postmortem analysis. These were studies of  
09:38:53 12 live porpoises, live dolphins in Barataria Bay.

09:38:57 13 And the investigators looked at -- assessed their health  
09:39:00 14 with a wide range of approaches. And they identified two areas of  
09:39:04 15 ill health for these dolphins; one is adrenal toxicity, production  
09:39:10 16 of hormones that dolphins, you and I need, for normal function was  
09:39:13 17 impaired. And a lung disease. A number of anomalies in their lungs  
09:39:19 18 deduced from ultrasound analyses of these dolphins. Both of those,  
09:39:26 19 the authors indicated, are consistent with previous information  
09:39:28 20 about the effects of oil on mammals, so that they found not only  
09:39:33 21 these anomalies, but also made the case that those effects were  
09:39:37 22 consistent with what we knew about the effects -- response of  
09:39:42 23 mammals to the exposure.

09:39:43 24 So it's a combination of both the dead bodies, if you  
09:39:46 25 will, the exposure situation, but also this detailed health study,

09:39:50 1 which suggests that this these dolphins in Barataria Bay, which, by  
09:39:54 2 the way, was the one embayment which was most heavily oiled and most  
09:39:58 3 persistently oiled in this spill, had ill health which threatened  
09:40:02 4 their survival.

09:40:04 5 Q. Now, what other indicators of harm did you observe to dolphins?

09:40:08 6 A. Well, you know, one of the things -- as I said before, it goes  
09:40:13 7 for birds as well as the turtles, I have to think when I look at  
09:40:18 8 these data in terms of the strandings and the number of dolphins  
09:40:21 9 that were found that, given the circumstances I described, there had  
09:40:24 10 to be some dolphins that were also affected that were not found, so  
09:40:28 11 that these estimates are probably minimal estimates.

09:40:31 12 And again, this is just in the cases with turtles, there  
09:40:35 13 was this increase in stranding rate. The number of dead dolphins  
09:40:39 14 washed up on beaches during 2010 went way up, and it went way up in  
09:40:44 15 particular during the months in which the spill was occurring.

09:40:46 16 Now, it is true that this unusual mortality event, as  
09:40:51 17 it's called in the field, actually preceded the blowout, that there  
09:40:57 18 was beginning to see this unusual number of strandings before the  
09:41:01 19 blowout. But it went up after the blowout, and, of course, the  
09:41:08 20 effects of the oil have to be viewed in the context of the other  
09:41:12 21 stressors that were responsible for this unusual mortality event as  
09:41:16 22 well.

09:41:17 23 Q. And what geographic region were dolphins harmed in?

09:41:24 24 A. The evidence, at this point, deals, again, from where the oil  
09:41:28 25 was occurring from Southeast Louisiana to the Florida panhandle.

09:41:32 1 Q. I want to discuss Dr. Tunnell's conclusions regarding dolphins.  
09:41:39 2 Do you agree that because some of the necropsies he cites do not  
09:41:47 3 list oil as the cause of death, oil did not negatively impact the  
09:41:51 4 dolphins in the Gulf?

09:41:53 5 A. No. Again, he didn't address dolphins in his initial evaluation  
09:41:59 6 at all. It's only in rebuttal of what I concluded. And I think one  
09:42:05 7 has to understand that, if an organism like a dolphin is going to be  
09:42:11 8 affected by oil, it's going to be things like we discussed;  
09:42:14 9 interference with its ability to breathe, its lung condition, the  
09:42:20 10 effect on adrenal processes, its hormonal effects. So it would be  
09:42:27 11 rare that an organism like a dolphin, which would be found in  
09:42:31 12 necropsies with its lungs full of oil or stomach full of oil, that's  
09:42:35 13 not the way that they're being affected. So that a lot of the other  
09:42:41 14 factors that are identified in the necropsies, for example,  
09:42:48 15 bacterial disease --

09:42:49 16 MR. BROCK: Your Honor, I am going to object to this as  
09:42:52 17 beyond the scope. I don't believe he cited a review of the  
09:42:56 18 necropsies in his expert reports. I think that's beyond the scope.

09:43:00 19 MS. ANDRE: Your Honor, he discusses Dr. Tunnell's  
09:43:03 20 criticism in his round 3 report, TREX 13185R at page 10.

09:43:11 21 BY MS. ANDRE:

09:43:12 22 Q. Dr. Boesch, did you look at necropsies themselves?

09:43:16 23 A. No, I looked at his characterizations.

09:43:22 24 THE COURT: So you're responding to his evaluation or his  
09:43:27 25 report there?

09:43:29 1 THE WITNESS: Right --

09:43:31 2 THE COURT: I guess the question is: Did you express this  
09:43:35 3 in any of your reports?

09:43:37 4 THE WITNESS: Yes, I did. His rebuttal of my finding that  
09:43:41 5 there was actual harm to dolphins said, "Well, the necropsies didn't  
09:43:46 6 show any evidence of that." And so, he referred to that. I  
09:43:51 7 actually, then, in my third report explained, just as I am trying to  
09:43:55 8 do now, why that would be the case.

09:43:56 9 THE COURT: Okay. Go ahead. Overrule the objection.

09:43:59 10 MR. BROCK: My objection is to description of the details  
09:44:01 11 of the autopsies which he is not has not reviewed.

09:44:05 12 THE COURT: Okay. Go ahead.

09:44:07 13 THE WITNESS: Right. I think I finished in that, in other  
09:44:09 14 words, to summarize, the oil -- the types of effects oil exposure  
09:44:14 15 would have wouldn't necessarily be evidenced in a necropsy that  
09:44:18 16 would suggest that there is, you know, oiling included in the  
09:44:22 17 animal's organs and tissues.

09:44:25 18 BY MS. ANDRE:

09:44:26 19 Q. Now, I want to pull up on the screen the studies that you were  
09:44:28 20 just referring to regarding adrenal and lung toxicity. Please pull  
09:44:33 21 up TREX 231481 and 231482. These are studies by Dr. Schwacke, et  
09:44:46 22 al. The first is entitled "Health of Common Bottlenose Dolphins in  
09:44:51 23 Barataria Bay, Louisiana, Following the *Deepwater Horizon* Oil  
09:44:54 24 Spill." And the second is entitled "Response to Comment on Health  
09:45:00 25 of Common Bottlenose Dolphins in Barataria Bay, Louisiana, Following



09:45:04 1 the Deepwater Oil Spill." Are these the documents that you relied  
09:45:09 2 on?

09:45:09 3 A. Yes. These and there's another publication which is actually  
09:45:15 4 the comment that this last one refers to. In other words, when  
09:45:19 5 Dr. Schwacke and company prepared and published their paper, another  
09:45:27 6 author wrote in rebuttal of their paper, a doctor, a scientist who  
09:45:31 7 is working as a consultant to BP, basically criticized that paper.  
09:45:35 8 And then the other paper that you see, the response paper, is the  
09:45:38 9 response to the critics, the criticism that was offered. So I  
09:45:42 10 considered all three.

09:45:43 11 Q. Let's also pull up that comment. It's TREX 24143 -- sorry.  
09:45:50 12 241493. And is this the response to Dr. Schwacke's original paper?

09:45:56 13 A. This is. This is.

09:45:57 14 Q. In his report, Dr. Tunnell criticizes your reliance on these  
09:46:03 15 articles. How do you respond to that criticism?

09:46:05 16 A. Well, I reviewed the paper for my own background and knowledge.  
09:46:13 17 I've reviewed the criticism, and I reviewed the scientists rebuttal.  
09:46:18 18 Dr. Tunnell just, basically, cites the criticism and doesn't cite --  
09:46:21 19 and it was published at the same time -- doesn't cite the authors --  
09:46:25 20 the original author's explanation in response to the criticism.

09:46:28 21           So I think my assessment of these papers is more  
09:46:34 22 comprehensive, and I did look very carefully at criticism. The  
09:46:39 23 criticism, in its essence, says that this is not a dose response  
09:46:42 24 study; that is, you don't know how the animals responded to various  
09:46:47 25 doses of oil. And the authors said, "Well, that's not practically

09:46:51 1 possible or ethically possible for something like the dolphins, that  
09:46:56 2 we use these multiple lines of evidence to compare the health of  
09:46:59 3 these dolphins in Barataria Bay using analogous approaches to the  
09:47:04 4 health of dolphins in Sarasota Bay." That's the comparison that was  
09:47:07 5 done.

09:47:08 6           So it was an observational study rather than an  
09:47:10 7 experimental exposure study. Because they couldn't control the  
09:47:14 8 experimental conditions, nor would anyone want them to  
09:47:18 9 experimentally expose the animals that way.

09:47:21 10 Q. So did Dr. Schwacke's response to any criticisms she's received  
09:47:27 11 satisfy you that -- to the reliability of her first round report?

09:47:31 12 A. It did.

09:47:32 13 Q. Let's move on to birds. Did you create a slide summarizing harm  
09:47:37 14 to birds from surface oiling?

09:47:38 15 A. I did.

09:47:39 16 Q. Let's call up D-32167, please. Now, I know many species were  
09:47:46 17 impacted, but can you name a few?

09:47:48 18 A. Yes, there were many species of birds that were affected, but  
09:47:52 19 the ones I think are most at risk were brown pelicans, laughing  
09:47:56 20 gulls, royal terns, and northern gannets.

09:48:00 21 Q. And how were birds actually harmed by the spill?

09:48:03 22 A. Well, the birds could be harmed in three different ways  
09:48:06 23 actually: One is the one that we see, you know, visually, the  
09:48:10 24 fouling of birds. When the birds get covered with oil and their  
09:48:17 25 feathers hold onto the oil, they lose their ability to float on the

09:48:21 1 water, they lose their ability to thermoregulate and can actually  
09:48:27 2 die because they're losing body temperature.

09:48:30 3 And then, in addition to that, the birds could be affected  
09:48:34 4 by toxicity. They naturally will tend to preen the oil, try to  
09:48:41 5 remove the oil from their wings, from their feathers, and, in the  
09:48:46 6 process, ingest oil.

09:48:47 7 And then, thirdly, if a habitat -- a critical habitat,  
09:48:51 8 marshes, mangroves along the coast are important as nesting sites,  
09:48:57 9 then, obviously, they suffer harm as well that way.

09:49:00 10 Q. Is there any disagreement among the parties that thousands of  
09:49:05 11 birds were collected during the response both oiled and unoiled?

09:49:09 12 A. I don't think so. I think the disagreement is that whether  
09:49:11 13 that's all there is, or whether that just basically is the tip of  
09:49:14 14 the iceberg and that there are many more birds killed than were  
09:49:20 15 collected. And also, differences about whether there could be  
09:49:23 16 population level consequences.

09:49:24 17 Q. Let's talk a little bit more about what you just mentioned.  
09:49:27 18 Now, understanding you've already explained in a general sense that  
09:49:31 19 when you find a carcass there may be many more that were impacted?

09:49:36 20 A. Uh-huh.

09:49:36 21 Q. Could you more specifically explain what kind of modeling is  
09:49:40 22 done to explain this impact on birds?

09:49:44 23 A. Right. So it's been well-known from assessment of oil spills  
09:49:47 24 that the number of birds that are actually killed was greater than  
09:49:50 25 the number of carcasses that are likely to wash up on the beach or

09:49:54 1 otherwise to collect. And there have been previous literature,  
09:49:58 2 which suggested that, and has led to the development of some models,  
09:50:02 3 mathematical assessments of what the full effect may be. Take into  
09:50:07 4 account, for example, how far off the oil was from the shore, so  
09:50:11 5 that if it's right on the shore, the chance that you can collect a  
09:50:14 6 dead birds is greater than 50, 100 miles offshore. They take into  
09:50:19 7 account the sinking rate of a dead bird or survival rate. In other  
09:50:23 8 words, if it's killed, it's not going to stay around for very long  
09:50:27 9 floating around in the Gulf. It could be eaten, could be  
09:50:30 10 decomposed, all of those kinds of things are taken into account in  
09:50:34 11 these models that attempt to estimate the full mortality from the  
09:50:38 12 limited observations of dead birds.

09:50:40 13 Q. And are these generally known as beach bird models?

09:50:43 14 A. Yes, they are.

09:50:44 15 Q. And what do modeling studies suggest was the range of birds  
09:50:51 16 killed in this case over the carcasses found?

09:50:55 17 A. Well, there's -- at this point, this is an area of active  
09:50:59 18 investigation, as I understand it, in the Natural Resources Damage  
09:51:03 19 Assessment, because this is a pretty critical issue for  
09:51:07 20 quantification. And I don't have that full information or evidence,  
09:51:09 21 so I can't tell you -- give my own estimate of the mortality.

09:51:13 22 There are two papers, actually, by the same authors  
09:51:16 23 that have attempted to estimate the total mortality based upon, in  
09:51:22 24 this particular incident, site specific considerations, on both  
09:51:27 25 coastal birds as well as oceanic birds. And collectively, they

09:51:32 1 would suggest that the mortality could be in the millions of birds,  
09:51:37 2 but that, in general, it will be about 100 times the number of dead  
09:51:41 3 birds that are collected.

09:51:43 4 Often in the case of previous spills, it's been  
09:51:47 5 suggested that it's a factor of ten more than was collected. I  
09:51:51 6 don't know what the actual number was, but it just -- I used that  
09:51:54 7 study not to rely on its estimate, but to suggest to -- to inform me  
09:51:59 8 that in terms of an impact on the populations, it had to be far more  
09:52:04 9 significant than just the body count of the birds would be.

09:52:07 10 Q. Let's identify that study for the Court. Please pull up TREX  
09:52:10 11 246253. Now, this is a study by Drs. Haney, et al, entitled "Acute  
09:52:22 12 Birds Mortality from the *Deepwater Horizon* MC 252 Oil Spill." Is  
09:52:27 13 this the study you were just referring to?

09:52:29 14 A. Yes, this is the study. But this is just the abstract of the  
09:52:32 15 study. The full paper, of course, was available to me and to -- we  
09:52:36 16 made it available with my expert report.

09:52:38 17 Q. And are you opining on the validity of Dr. Haney's model  
09:52:42 18 specifically?

09:52:42 19 A. No. I can't attest -- I am not an expert in this area, so I  
09:52:47 20 can't attest to all of the details. And I'm sure there is going to  
09:52:51 21 be more papers on this published and criticisms. My main issue I  
09:52:55 22 drew from this is that -- two things: First of all, the mortality  
09:53:00 23 has to be substantially greater. I am not sure if it's 1,000 times  
09:53:04 24 greater, but it's substantially greater than what just the carcasses  
09:53:09 25 would suggest.

09:53:10 1                   And then, secondly, it helped me understand the  
09:53:13 2 birds species that are most likely, most susceptible, based upon  
09:53:17 3 their modeling and where the birds were, where they live and those  
09:53:20 4 other characteristics that I mentioned, that effects whether they're  
09:53:25 5 washed out to sea, or sunk, or lost that way.

09:53:27 6 Q. And would you say that the use and alliance on beach bird models  
09:53:33 7 is a generally accepted practice?

09:53:36 8 A. I think it's an area that's evolving, and I think there will be  
09:53:39 9 a lot more understanding as the studies go on in this spill. But  
09:53:43 10 it's a practice that's been used. I think there would probably be  
09:53:47 11 consensus in the community that there is no standard model, no gold  
09:53:51 12 standard model yet used, but I think we're moving in the right  
09:53:55 13 direction of bringing all of these other factors into account.

09:53:58 14 Q. Now, BP's experts also offer opinions on impacts of birds. Did  
09:54:05 15 you prepare a slide summarizing your opinion of Dr. Tunnell's  
09:54:09 16 conclusions?

09:54:09 17 A. Yes, I did.

09:54:09 18 Q. Please call up D-32168. First, what sources of data did  
09:54:17 19 Dr. Tunnell rely upon?

09:54:18 20 A. Well, he didn't attempt to try to draw any of his own  
09:54:22 21 interpretations of how many birds were killed. He relied on the --  
09:54:30 22 again, surveys that are done that could help understand variations  
09:54:35 23 in bird populations over time. The two survey sources he has used  
09:54:40 24 are, one, the Christmas Bird Counts done by the Audubon Society.  
09:54:45 25 This is an annual activity that takes place around Christmastime

09:54:49 1 where volunteers go out and within a 15 -- an area 15 miles  
09:54:54 2 diameter, try to count all of the birds that are there. And another  
09:55:00 3 one is the Breeding Bird Census.

09:55:02 4           So what I've indicated here on the bottom, this figure,  
09:55:06 5 are the location of those Christmas Bird Counts, and the rectangles  
09:55:10 6 are the areas where there are these more linear surveys that have  
09:55:14 7 been done. So those are the data he used. And he basically says he  
09:55:18 8 sees no reduction in the abundance of those birds based upon those  
09:55:22 9 data.

09:55:2210 Q. What is the significance of Dr. Tunnell's reliance on land-based  
09:55:2711 stations that are depicted here in this figure?

09:55:2912 A. These are surveys done by people walking on land, and so they  
09:55:3413 don't -- they miss a lot of where these birds actually occur. So  
09:55:3914 imagine if you're just standing on a beach; for example, one of  
09:55:4215 these sites is at Grand Isle. And by just counting the number of  
09:55:4516 brown pelicans you see from Grand Isle, is that really a good  
09:55:4917 appraisal of the total population of pelicans, even though most of  
09:55:5418 them could be well offshore?

09:55:5619           So not only the land-based location, but the sparsity. So  
09:55:5920 the whole Southeast Louisiana and all of its exposure to the oil in  
09:56:0321 this case, is only represented by Christmas Bird Counts in Venice  
09:56:0722 and in Grand Isle. The breeding bird survey that was done, that  
09:56:1123 little rectangle to the west, is south of Jeanerette, which is well  
09:56:1524 removed from where there was any oil.

09:56:1825           So there are many of these stations, as you can see in

09:56:20 1 Texas, in Southwest Louisiana and the Florida Gulf Coast, that  
09:56:25 2 include, again, bring in data -- abundance data from areas outside  
09:56:30 3 of the oil and average those with the other data. So it obscures  
09:56:33 4 any effect that might have been evident in the data, if there were  
09:56:36 5 any effects of it.

09:56:40 6 Q. Now, this map that you've listed here depicts the maximum oiling  
09:56:44 7 categories based on SCAT data; is that right?

09:56:47 8 A. That's correct. So in this case, you see the blue lines, which  
09:56:50 9 are the areas surveyed again, but in the various color codes from  
09:56:54 10 heavy, moderate, light, very light, you'll see where that oil  
09:56:58 11 actually went and you'll see the heavy impact in and around  
09:57:01 12 Barataria Bay, the lower part of Terrebonne Bay, but also along the  
09:57:05 13 beaches of Mississippi, Alabama, and -- Mississippi and Alabama and  
09:57:11 14 far West Florida for example. So you'll see that many of the survey  
09:57:15 15 points are well outside of the areas that have moderate to heavy  
09:57:19 16 oil.

09:57:19 17 Q. And can you, please, briefly explain the third criticism you've  
09:57:23 18 listed on this slide?

09:57:24 19 A. Yes. Because he is averaging over these large areas and because  
09:57:28 20 he is using -- they're using volunteer observations and -- from  
09:57:32 21 land-based sources, you know, one could surmise that if there was an  
09:57:36 22 impact that totally decimated all of the pelicans in the Gulf of  
09:57:40 23 Mexico, you could maybe see it. Probably would see it. But short  
09:57:44 24 of that, you know, other than a catastrophic effect, the resolving  
09:57:48 25 power of this kind of analysis is very low.



09:57:51 1 Q. Now, I would like to discuss the last zone of impact that you  
09:57:56 2 identified earlier for the Court on your conclusion slide and that's  
09:57:59 3 coastal habitats. Have you prepared a summary slide about shoreline  
09:58:04 4 oiling resulting from the spill?

09:58:05 5 A. I have.

09:58:06 6 Q. Please call up D-32169. Now, we'll discuss both marshes and  
09:58:17 7 beaches in more detail, but can you, please, provide an overview of  
09:58:21 8 the total extent of miles visibly oiled by the spill?

09:58:26 9 A. Yes. In the SCAT surveys, which, again, are done for response,  
09:58:30 10 they're not the assessment of impacts. It's basically -- they're  
09:58:34 11 surveying where to deploy their resources to protect or cleanup  
09:58:40 12 stranded oil.

09:58:42 13 So of that, 1102 to be precise, miles of shoreline had  
09:58:49 14 visible oiling. And of that -- and again, I have to bring in  
09:58:55 15 another 36 miles in Texas could be, or 38 miles in Texas could be  
09:59:01 16 included in that as well.

09:59:04 17 So of that about 45 percent, slightly less than half of  
09:59:09 18 that shoreline was actually marsh shoreline, which is important  
09:59:13 19 because they're not recreationally important, people want their  
09:59:18 20 beaches clean, they're areas where they can't easily be cleaned up.

09:59:22 21 Q. And it lists here the amount of oiling as of May 2014. How many  
09:59:28 22 miles were still oiled at that time based on the SCAT observation of  
09:59:33 23 visible oiling?

09:59:33 24 A. In May 2014 it says there were 393 miles still oiled. And you  
09:59:39 25 can tell through the end of this last year there's always, not

09:59:44 1 always, but there are issues where new oil is found. Generally in  
09:59:50 2 some sort of a buried mat, the oil is mixed with sand and then  
09:59:55 3 covered over by the sand and then the waves expose it, new oil is  
09:59:59 4 being released in small droplets, in pellets of oil, oil and sand  
10:00:06 5 aggregates or mats, these things continue to occur and provide some  
10:00:12 6 level of continued exposure.

10:00:13 7 We don't know fully what the consequences on the organisms  
10:00:17 8 on the beach that is, which is why I didn't include it as a  
10:00:21 9 potential harm at this time. But that there is a long-term residual  
10:00:27 10 on beaches.

10:00:28 11 Q. Of the 1100 miles oiled, how many were categorized as moderately  
10:00:35 12 or heavily oiled?

10:00:37 13 A. 220 miles were moderately to heavily oiled.

10:00:41 14 Q. Now, you've already mentioned that the SCAT surveys were meant  
10:00:44 15 to detect visible oiling for response. Can you give a brief  
10:00:50 16 description of what those surveys included?

10:00:52 17 A. Well, these are teams of people that are going out looking for  
10:00:55 18 where oil is so they can guide where the cleanup activities are. So  
10:01:00 19 in some cases, particularly the marshes, there was reference I think  
10:01:06 20 in someone's testimony yesterday about walking these beaches. Well,  
10:01:09 21 some of these areas couldn't be walked, you don't want to walk along  
10:01:13 22 a marsh area, even if you could, because you could damage the marsh.

10:01:17 23 So some of them were also done more remotely by boats and  
10:01:20 24 the like. And again, these are all visual evidence, so it's not  
10:01:24 25 chemical evidence; and subsequent work to identify where there is

10:01:29 1 chemically determined contamination, as well as more in-depth  
10:01:36 2 visible examination, for example, the NRDA process, shown that there  
10:01:40 3 are areas that were not initially labeled as oil under SCAT, which  
10:01:44 4 they found visible and/or chemical evidence of oiling subsequently.

10:01:49 5           So I think this linear miles of shoreline oil is kind of a  
10:01:53 6 minimal estimate.

10:01:54 7 Q. Did BP's assessment of length of shoreline differ from your own?

10:02:02 8 A. I think the only dispute was the Texas portions of the area in  
10:02:06 9 Texas they've tended to rely solely on the SCAT work. It differs in  
10:02:11 10 terms of how you interpret the data but not the original linear  
10:02:18 11 shoreline data.

10:02:19 12 Q. When you say that BP's expert Dr. Taylor considers the SCAT  
10:02:24 13 miles of visibly oiled shoreline a floor or a ceiling of total  
10:02:30 14 shoreline oiling?

10:02:31 15 A. Well, I think that's a good -- an apt description because I  
10:02:34 16 think he kind of describes it as a floor and thinks that's less  
10:02:39 17 of -- that mileage was actually oil as general estimates. And I kind  
10:02:42 18 of agree with that distinction and would consider it more of a -- he  
10:02:46 19 would consider it a ceiling and I would consider it more of a floor  
10:02:49 20 of the estimate.

10:02:49 21 Q. Let's discuss beaches in greater detail. Have you prepared a  
10:02:55 22 slide summarizing impact of oiling on beaches?

10:02:57 23 A. I have.

10:02:58 24 Q. Please call up D-32170. Can you describe the nature of the  
10:03:05 25 oiling -- the nature of the oil that landed on the beaches?

10:03:06 1 A. Yes. So that when this oil came ashore it didn't come as oil as  
10:03:13 2 we know, it it's been out in the Gulf for sometime and it's  
10:03:16 3 degrading and changing. And in particular it gets mixed in with  
10:03:21 4 waters of the Gulf. So when it comes ashore, it's not this black  
10:03:25 5 crude oil, it's this mahogany colored muck, muck that take place,  
10:03:31 6 which means it has a lot of water included in it.

10:03:34 7 So these are the kinds of things that we were trying to  
10:03:37 8 remove from beaches. And in addition as the oil, that oil gets then  
10:03:42 9 mixed in with the sand, these little tar balls with sand and  
10:03:47 10 submerged oil mats and buried oil can occur.

10:03:50 11 Q. And what is the scope and duration of beach oiling?

10:03:54 12 A. Well, of that total remainder of the marsh about 560 miles were  
10:04:00 13 oiled and of this 170 were moderately or heavily oiled. And there  
10:04:06 14 are still some areas, at least as of June -- of last year, and I  
10:04:12 15 don't know the extent, but into last year, which is buried oil was  
10:04:16 16 still being found and recovered.

10:04:17 17 Q. And again, all of these numbers are based on SCAT observations  
10:04:21 18 of visible oiling, correct?

10:04:22 19 A. That's correct.

10:04:22 20 Q. What other ecosystem consequences did you consider resulting  
10:04:28 21 from oiling on beaches?

10:04:29 22 A. Well, I was unable to draw any real conclusions about the harm  
10:04:35 23 done to the natural system on beaches. But that I did point out  
10:04:38 24 that the cleanup activities, as important as they were to remove the  
10:04:43 25 oil from the environment and to restore its recreational amenities,

10:04:48 1 also was not without consequence. So from trucks riding on beaches  
10:04:53 2 to the fact that many of these beaches were scraped and sieved, it  
10:04:58 3 changes sort of the texture of the beach and the sand and shell  
10:05:02 4 mixture which has broader implications in terms of the ecological  
10:05:07 5 nature of the beaches as well. I didn't attempt to quantify it, I  
10:05:10 6 just merely pointed them out.

10:05:11 7 Q. Let's talk about impacts on marshes and mangroves now. Have you  
10:05:16 8 prepared a slide summarizing those impacts?

10:05:18 9 A. I have.

10:05:1810 Q. Please call up D-32171. At the beaches, can you describe the  
10:05:2411 nature of oiling that occurred in marshes and mangroves?

10:05:2712 A. Yes. Again, the oil came away -- came in the same way with  
10:05:3113 emulsified puddles. It coated marsh plants. And also in some cases  
10:05:3614 because of the -- have you ever seen a marsh surface with little  
10:05:4015 holes and burrows, some of that oil can then seep into the  
10:05:4316 subsurface soil.

10:05:4617 So physically the initial effect as you see in the middle  
10:05:5118 picture here is within a few meters of where the oil came ashore,  
10:05:5519 that area of marsh was obviously heavily coated and affected.

10:05:5820 Q. What species of marsh vegetation were impacted?

10:06:0121 A. The species that occurred in those cases, which are for the most  
10:06:0622 part this common salt marsh cordgrass, most of the marsh plants we  
10:06:1223 know commonly. In addition, black needlerush, which is another  
10:06:1724 marsh plant, sort of a darker color, has a little needle-like tip on  
10:06:1925 it. And in the lower Mississippi Delta, common reed was affected.

10:06:25 1 And in some cases, mangroves in Barataria Bay region in particular  
10:06:29 2 were affected.

10:06:30 3 Q. What ecosystem consequences did you observe as a result of  
10:06:35 4 moderate and heavy oiling in the marshes?

10:06:37 5 A. Well, in some cases -- this is not in dispute -- there is  
10:06:42 6 permanent marsh loss. So where the oiling in the soil was heavy  
10:06:46 7 enough to kill not only the surface vegetation, the blades of grass,  
10:06:50 8 but also the roots and rhizomes, the death of that plant tissue  
10:06:56 9 resulted in the disintegration of the soil texture. So about a half  
10:07:00 10 meter, foot and a half of soil is just lifted up and eroded away and  
10:07:04 11 the marsh eroded back is one of the most severe effects of the  
10:07:10 12 oiling.

10:07:10 13 In other cases the plants, vegetation regrew, but it's a  
10:07:15 14 long-term question about whether the fabric of the soil, even where  
10:07:19 15 the vegetation regrew has been weakened to the point where it's  
10:07:23 16 actually allowed that area to be more susceptible to erosion.

10:07:27 17 Q. And what's your opinion of cumulative effects of oiling and  
10:07:31 18 other stressors on the marsh?

10:07:32 19 A. Well, these marshes are in trouble. I mean, they're  
10:07:38 20 disappearing, and particularly in the Mississippi Delta region for a  
10:07:42 21 variety of reasons related to relative sea level rise and land  
10:07:46 22 sinking and the like. And so any additional effect is of concern.  
10:07:51 23 And so one has to put that in a broader context of the cumulative  
10:07:57 24 effects of all of the things that are going on that affect the  
10:08:00 25 survival of marshes.

10:08:02 1           Where the marshes eroded away, either initially or  
10:08:08 2 subsequently because of this weakening phenomenon, it's important to  
10:08:10 3 understand that they are not going to regrow. In Louisiana they  
10:08:15 4 don't come back once they're eroded and regrow, without intervention  
10:08:17 5 by man, but pumping dredge sediment or river sediment diversions and  
10:08:22 6 that sort of thing.

10:08:23 7           So we have to understand these are serious permanent  
10:08:27 8 consequences.

10:08:27 9 Q. And how many miles of marsh were moderately or heavily oiled?

10:08:32 10 A. In the area, again mostly in Barataria Bay, but some elsewhere,  
10:08:37 11 about 60 miles, linear miles were monitored on behalf of the oil.

10:08:42 12 Q. Dr. Taylor, expert from BP, also presents his opinion about  
10:08:48 13 marsh oiling. Have you prepared a slide summarizing your criticisms  
10:08:52 14 of Dr. Taylor?

10:08:53 15 A. I have.

10:08:53 16 Q. Please call up D-32172. First, does Dr. Taylor's reliance on  
10:09:02 17 observations of oil and vegetation omit certain impacts?

10:09:06 18 A. Yes. Because, again, he is using the visual observations of  
10:09:10 19 oiling, and subsequent studies using sensitive chemical techniques  
10:09:15 20 have shown that over time as the tide height varies and of course we  
10:09:22 21 have hurricanes, Hurricane Isaac, that will move the oil well into  
10:09:26 22 other marsh and deeper into the marsh. It may not be evident  
10:09:29 23 visually but it's detectable chemically.

10:09:32 24 Q. Does Dr. Taylor consider soil contamination in the marshes?

10:09:36 25 A. He generally disregards it, he says that the oil didn't sink

10:09:41 1 into the soil. But I think, again, subsequent research has shown  
10:09:44 2 that it did to a certain degree.

10:09:46 3 Q. Does Dr. Taylor's report accurately assess the persistence of  
10:09:51 4 these impacts?

10:09:52 5 A. No, I think he de-emphasizes that. And, in fact, there have  
10:09:55 6 been active studies of looking at the contamination chemically  
10:10:00 7 measured that gives us a better understanding of the degradation  
10:10:03 8 rates or persistence rates of various compounds of oil in these  
10:10:08 9 marshes.

10:10:08 10 Q. I want to pull up an example of one of the articles that  
10:10:13 11 discusses penetration into the marshes. Please call up TREX 231539.  
10:10:23 12 This is an article by Dr. Turner, et al, entitled "Distribution and  
10:10:27 13 Recovery Trajectory of Macondo Oil in Louisiana Coastal Wetlands."  
10:10:32 14 Is this one of the articles you considered in your analysis,  
10:10:35 15 Dr. Boesch?

10:10:35 16 A. Yes, it is. It's a very important article and I am happy to  
10:10:39 17 explain why.

10:10:39 18 Q. Please do.

10:10:40 19 A. First of all, these scientists went out before the oil came in  
10:10:46 20 to shore and took some samples, baseline samples before the oil  
10:10:49 21 actually hit; so they have a pretty good understanding of what the  
10:10:53 22 background contamination might be. Then they've actually done some  
10:10:56 23 detailed chemical analyses from the degradation rates over time of  
10:11:02 24 other -- of the various components, the alkane components and then  
10:11:07 25 these PAHs, the polycyclic aromatic hydrocarbons, were also assessed



10:11:13 1 so they can watch how those degrade over time, either by dilution or  
10:11:18 2 by biodegradation.

10:11:19 3 Q. And Dr. Turner and his team did observe lasting penetration by  
10:11:24 4 oil in soil underneath the marshes, correct?

10:11:28 5 A. Yes. There were substantial -- as late as June of 2013, which  
10:11:32 6 is the last data they had in this paper that appeared in 2014, they  
10:11:38 7 showed that there was substantial elevation of both of those sets of  
10:11:44 8 compounds in oiled marshes.

10:11:48 9 They also made some suggestion that based upon the  
10:11:52 10 degradation rates they had seen, that the alkanes, these are the  
10:11:56 11 ones we're less concerned about, but sticky, oily components, are on  
10:12:02 12 their way to degradation and could be degraded back to background  
10:12:06 13 within a year or so from now. But that the PAHs could take several  
10:12:11 14 decades to degrade to point where -- their background  
10:12:14 15 concentrations.

10:12:14 16 Q. And finally, regarding your impacts -- or your opinions, rather,  
10:12:17 17 of Dr. Taylor's analysis, does he effectively evaluate cumulative  
10:12:22 18 impacts of oiling on marsh?

10:12:24 19 A. Not really. Not in way that satisfies me in terms of looking at  
10:12:28 20 the other effects. In fact, he even goes so far to say that this  
10:12:32 21 area that was eroded, the severely damage marsh edge that was eroded  
10:12:36 22 would have been eroded anyway because of the shorelines are  
10:12:40 23 retreating. But that sort of fails to think that we just shifted  
10:12:43 24 the baseline inland and that erosion will continue from a deeper  
10:12:47 25 baseline. So I think it's, once again, a point, an approach that

10:12:51 1 minimizes the real harm.

10:12:54 2 Q. All right, Dr. Boesch, let's turn to your final topic, and  
10:12:57 3 that's impact of oiling in marshes on the animals that live there.  
10:13:02 4 Have you prepared a slide summarizing your assessment?

10:13:04 5 A. I have.

10:13:05 6 Q. Please call up D-32173. Let's start with birds. And you've  
10:13:13 7 really already discussed this. But did you have anything to add  
10:13:16 8 about the impact of marsh oiling on birds that nest there?

10:13:20 9 A. No, other than to say that one of the areas that's a particular  
10:13:23 10 focus in understanding these effects is the disappearance of heavily  
10:13:27 11 oiled mangrove areas in lower Barataria Bay that are nesting sites  
10:13:34 12 for both brown pelicans and spoonbills.

10:13:36 13 Q. How were other animals that live in or around the marsh impacted  
10:13:41 14 by the spill?

10:13:42 15 A. So if you've ever been to a marsh you know there are lots of  
10:13:45 16 critters and there are lost insects, but there are also lots of  
10:13:47 17 little crustaceans, crabs that run along the surface and so on. As  
10:13:51 18 well as we know that these marshes are important as nurseries for  
10:13:54 19 like juvenile shrimp.

10:13:56 20 So all of those organisms are subject to the exposure of  
10:13:59 21 this long-term contamination. And there is evidence in some of  
10:14:03 22 them, for example, the small crustaceans, as well as the insects,  
10:14:08 23 fiddler crabs, where there was damage, you know, to the populations  
10:14:14 24 determined.

10:14:15 25 In addition to that, there is other studies both on

10:14:18 1 killifish -- these are the little salt marsh minnows that we use for  
10:14:21 2 bait in this part of the world -- and brown and white shrimp whose  
10:14:26 3 growth rates were lowered in areas that were exposed.

10:14:28 4 So all of that brings together evidence not only  
10:14:31 5 marshes but the animals that depend on them were harmed.

10:14:34 6 Q. Please describe your conclusions regarding impacts to oysters  
10:14:39 7 and oyster spat.

10:14:41 8 A. Well, oysters and oyster spats is still a mystery. Because in  
10:14:47 9 addition to the other, to oil, there are other steps taking opening  
10:14:52 10 river diversion to keep the oil penetrating into the estuaries.  
10:14:55 11 That also we know that had an effect. So, I think, as I understand  
10:14:59 12 it, there's active work by the State Department of Wildlife and  
10:15:03 13 Fisheries and scientists trying to unravel all of these things.  
10:15:06 14 There are also natural causes, diseases, harvest pressure. But it's  
10:15:10 15 pretty clear and worry that the population levels in the areas that  
10:15:14 16 were affected are still down and most importantly they're having  
10:15:17 17 trouble with recruitment, the little spat of oysters that come every  
10:15:22 18 year seems to be affected. So this is a matter of active  
10:15:26 19 investigation.

10:15:28 20 MS. ANDRE: Thank you, Dr. Boesch. Your Honor, I have no  
10:15:30 21 further questions at this time.

10:15:31 22 THE COURT: All right. Let's go ahead and take our  
10:15:34 23 15-minute recess. It's about 10:15.

10:15:36 24 THE DEPUTY CLERK: All rise.

10:15:37 25 (WHEREUPON, A RECESS WAS TAKEN.)

10:33:42 1 (OPEN COURT.)

10:33:43 2 THE COURT: All right. Everyone be seated please. All  
10:33:46 3 right. Mr. Brock.

10:33:48 4 MR. BROCK: Thank you, your Honor. Mike Brock, and I have  
10:33:50 5 the witness on cross-examination.

10:33:52 6 CROSS-EXAMINATION

10:33:53 7 BY MR. BROCK:

10:33:54 8 Q. Dr. Boesch, I want to start with the issue of natural oil seeps  
10:33:58 9 in the Gulf of Mexico. Do you remember testifying about that on  
10:34:00 10 your direct examination?

10:34:02 11 A. Yes, I do.

10:34:02 12 Q. And you referenced that it has been estimated that between 1,500  
10:34:10 13 and 3,800 barrels of oil seep into the Gulf of Mexico on a daily  
10:34:15 14 basis, correct?

10:34:17 15 A. That's for the entire Gulf, that's correct.

10:34:19 16 Q. Yes. You actually put that number in your report, didn't you?

10:34:22 17 A. I did.

10:34:22 18 Q. And if we look at the high end of the range there, we would say  
10:34:27 19 that up to 1.387 million barrels of oil flow into the Gulf of Mexico  
10:34:38 20 every year from natural seeps?

10:34:40 21 A. I trust your math. That's about right.

10:34:44 22 Q. Natural seeps in the Gulf of Mexico have led to the presence of  
10:34:50 23 bacterial colonies that are capable of metabolizing oil, correct?

10:34:55 24 A. I think those bacteria occur throughout the world's ocean, not  
10:34:58 25 just the Gulf of Mexico.

10:34:59 1 Q. We're going to focus on the Gulf of Mexico today, but they do  
10:35:03 2 appear in the Gulf of Mexico, do they not?

10:35:05 3 A. There are bacteria that are evolved to degrade hydrocarbons  
10:35:08 4 throughout the world oceans.

10:35:10 5 Q. And they are known to proliferate in the presence of  
10:35:12 6 hydrocarbons in the water column, are they not?

10:35:14 7 A. That's correct.

10:35:15 8 Q. And that happened here at the Macondo incident. That has been  
10:35:18 9 studied also, hasn't it?

10:35:19 10 A. It did.

10:35:20 11 Q. Now, you would agree that within hours of exiting the wellhead,  
10:35:28 12 that is within hours of oil exiting the wellhead, components of the  
10:35:33 13 oil would be subject to biodegradation, correct? Biodegradation,  
10:35:40 14 correct?

10:35:41 15 A. Well, I don't know the rate in that time, but, certainly, over  
10:35:44 16 days to weeks, the degradation could be measured.

10:35:47 17 Q. It's happening, though, within a short period of time after the  
10:35:51 18 oil enters the water column from the well, correct?

10:35:55 19 A. Within days to weeks, right.

10:35:56 20 Q. Now, conditions under which the oil was released from the  
10:36:04 21 wellhead, in this case, resulted in the formation of smaller  
10:36:10 22 droplets of oil than would form in a lower velocity spill. You  
10:36:15 23 agree with that?

10:36:15 24 A. I think that's true. In addition to, of course, there were  
10:36:18 25 dispersants applied there which also contributed to that effect.

10:36:20 1 Q. Correct. Thank you. And the point there is that the  
10:36:24 2 formulation of smaller droplets increased the surface area of the  
10:36:29 3 oil, correct?

10:36:30 4 A. That's correct.

10:36:30 5 Q. And when you increase the surface area of the oil, the bacteria  
10:36:35 6 that we've been referring to have a greater opportunity to consume  
10:36:40 7 the hydrocarbon?

10:36:41 8 A. That's correct. As does -- as do the hydrocarbons have a  
10:36:44 9 greater possibility of dissolving in the ocean water.

10:36:47 10 Q. Now, once oil reaches the surface, it continues to be subject to  
10:36:54 11 biodegradation as it travels toward the shoreline. That's true,  
10:36:59 12 too, isn't it?

10:37:00 13 A. That's true.

10:37:07 14 Q. At this point, has anyone demonstrated through valid scientific  
10:37:10 15 evidence that there were broader consequences to the ecosystem  
10:37:15 16 associated with biodegradation from this spill?

10:37:18 17 A. The consequences of biodegradation itself?

10:37:25 18 Q. Yes.

10:37:26 19 A. Yes, indeed. That's the basis of this formation of oily marine  
10:37:31 20 snow that I mentioned. That is as bacterial populations proliferate  
10:37:37 21 and age and create mucus, this, then, settles down, carries oil to  
10:37:42 22 the bottom. So I would think that is one of the potentially harmful  
10:37:45 23 consequences of creation of bacterial plume.

10:37:48 24 Q. So you used a word right there at the end that's very helpful,  
10:37:52 25 which is "potentially," correct? It could potentially impact the

10:37:58 1 environment?

10:37:59 2 A. This -- I think this was the case of actually, because we know  
10:38:02 3 well about the deposition of this oily residue. And there is now  
10:38:07 4 solid -- several scientific publications which strongly document the  
10:38:13 5 process by which these residues formed and were deposited.

10:38:16 6 Q. I am going to ask you one more question on this, and let me see  
10:38:20 7 what your answer is. No one has determined the consequences to the  
10:38:23 8 broader ecosystem of the biodegradation connected to the spill, is  
10:38:29 9 that correct?

10:38:35 10 A. Not -- certainly, not all of the consequences, but I, indeed,  
10:38:38 11 discussed a number of them.

10:38:39 12 Q. Let me see Dr. Boesch's deposition at 53, line 22. I'll call  
10:38:50 13 your attention to a question that you were asked in your deposition.  
10:38:52 14 We'll look at the answer, and then I'll ask you if this is what you  
10:38:56 15 testified to under oath when your deposition was taken.

10:39:00 16 "So at this point, no one has determined the consequences  
10:39:04 17 to the broader ecosystem of biodegradation connected to this oil  
10:39:09 18 spill; is that correct?" And may we see the answer, please. The  
10:39:15 19 first thing you said in response to that question, was, "Yes," was  
10:39:19 20 it not?

10:39:20 21 A. Yeah, but --

10:39:22 22 Q. Did you say, "Yes," please? I'll let you explain, but let me  
10:39:26 23 finish this piece, and then you will be able to explain. Did you  
10:39:28 24 say "Yes"?

10:39:29 25 A. I said, "Yes" accompanied by a sentence.

10:39:31 1 Q. And then you said, "The way I've treated these various effects,  
10:39:35 2 I would put that in the category of potential, rather than actual."  
10:39:38 3 Is that what you told us at your deposition?

10:39:40 4 A. That's what I said, but you've -- we've had more chance to  
10:39:45 5 describe exactly what you mean by the question here than I did when  
10:39:48 6 the deposition took place.

10:39:49 7 Q. Your testimony under oath is that no one has determined the  
10:39:53 8 consequences to the broader ecosystem of the biodegradation  
10:39:56 9 connected to the spill. Your answer to that was "yes," that's why  
10:40:00 10 it's in potential, correct?

10:40:02 11 A. That's what I -- that's what the deposition said.

10:40:07 12 Q. Thank you.

10:40:12 13 MS. ANDRE: Excuse me. Dr. Boesch, were you finished?

10:40:16 14 THE WITNESS: Other than to reiterate the question that  
10:40:17 15 Mr. Brock just asked me, gave me a chance to elaborate on what part  
10:40:21 16 of the broader consequences I felt were actual. And the question  
10:40:25 17 was so general that I interpreted it at the time as meaning every  
10:40:31 18 consequence. And I would think that there are consequences which  
10:40:34 19 are potential other than the actual consequences that actual harm  
10:40:38 20 that I described. That, in retrospect, is what I think I was  
10:40:42 21 answering the question to.

10:40:44 22 BY MR. BROCK:

10:40:45 23 Q. Let's move on. When oil is coming to the surface and it is  
10:40:52 24 subject to biodegradation, it becomes less concentrated, does it  
10:40:58 25 not?



10:40:58 1 A. When it becomes less concentrated, could you give me,  
10:41:05 2 specifically, per unit what?

10:41:07 3 Q. I'll use your words from the deposition. It becomes less  
10:41:11 4 concentrated because of the turbulent nature of the mixing of the  
10:41:15 5 water.

10:41:15 6 A. Oh, thank you. It does, because if you have certain amount of  
10:41:19 7 material in solution in suspension, and if you increase the volume  
10:41:23 8 of that by the turbulent mixes, it would decrease the concentration,  
10:41:27 9 correct.

10:41:27 10 Q. And there's a second part of that that includes the  
10:41:30 11 biodegradation that we have been referring to, correct, sir?

10:41:34 12 A. Second part of the forces that reduce the concentration?

10:41:37 13 Q. Correct.

10:41:38 14 A. Yes.

10:41:38 15 Q. Thank you. Now, you also agree, do you not, the soluble  
10:41:45 16 hydrocarbons would have dissolved as part of the biodegradation  
10:41:51 17 process, correct?

10:41:54 18 A. No, the soluble hydrocarbons dissolved as a result of physical  
10:41:58 19 processes by which the materials go into solution. It doesn't --  
10:42:02 20 they need degradation to happen to have that phenomenon take place.

10:42:08 21 Q. Let's take methane. Do you agree that most of the methane would  
10:42:12 22 have dissolved before the oil reached the surface?

10:42:14 23 A. Yes, indeed, and I discussed this in the report. Most of the  
10:42:18 24 gaseous hydrocarbons were dissolved into the deep Gulf and never  
10:42:22 25 rose to the surface.

10:42:22 1 Q. That's one of the ones I'm talking about. Another important  
10:42:26 2 component of hydrocarbons is benzene, correct?

10:42:29 3 A. That's correct.

10:42:29 4 Q. And you agree that a substantial portion of the benzene that was  
10:42:34 5 in the hydrocarbon mix would have dissolved by the time the oil  
10:42:39 6 reached the surface of the water?

10:42:40 7 A. I think that's a fair characterization. I can't quantify what  
10:42:45 8 substantial is because I don't have the literature before me. But  
10:42:48 9 that is an issue which has been study and, indeed, much of the  
10:42:52 10 benzene went into solution.

10:42:53 11 Q. Now, photo degradation is also a way in which Mother Nature  
10:43:04 12 helps to degrade oil after it reaches the surface, correct?

10:43:10 13 A. Photodegradation is the natural process by which the compounds,  
10:43:13 14 certain compounds can be broken apart into smaller compounds.

10:43:17 15 Q. And as they're broken to smaller compounds, again,  
10:43:21 16 biodegradation, then, has the opportunity, through the bacteria, to  
10:43:28 17 eliminate the hydrocarbon from the ecosystem?

10:43:30 18 A. It's not quite that straightforward because some photo or  
10:43:34 19 compounds that are created through light processes, the light  
10:43:40 20 striking it actually can become fairly resistant to biodegradation.  
10:43:45 21 Some of the degradation can be enhanced.

10:43:46 22 Q. Let's do it this way. Do you agree that because there's more  
10:43:49 23 light on the surface, it's more subject to photodegradation?

10:43:52 24 A. Yes.

10:43:52 25 Q. Now, let's pull up, if we could, TREF 13191.1.4, please. Do you

10:44:02 1 see that this is an e-mail, Dr. Boesch, from you to Terry Garcia?

10:44:06 2 A. Right.

10:44:07 3 Q. And you are referring to here to the Sea Grant report on the  
10:44:12 4 spill status, correct?

10:44:14 5 A. That's correct.

10:44:14 6 Q. You're familiar with this e-mail, are you not?

10:44:16 7 A. I am.

10:44:17 8 Q. I want to call up now the -- or just draw your attention to --  
10:44:26 9 can I see where it begins, where it says, "Thanks Terry"? I think  
10:44:29 10 that's 1.1.2. And you are just telling Terry Garcia, "I read this  
10:44:37 11 report with great interest." Do you see that?

10:44:39 12 A. I do.

10:44:39 13 Q. And then, if we go to 131319.1.4, I would like to read this  
10:44:51 14 statement to you. You say, "Perhaps, the most sensible statement in  
10:44:53 15 the report is 'Fortunately, natural weathering processes are  
10:44:58 16 transforming, diluting, degrading, and evaporating the various  
10:45:03 17 compounds that make up what we collectively call crude oil.'" Do  
10:45:08 18 you see that?

10:45:08 19 A. I do.

10:45:08 20 Q. And did you write that?

10:45:10 21 A. I wrote it. I quoted the report with that statement. The part  
10:45:15 22 in quotes is from -- not my words but words of the report.

10:45:18 23 Q. You endorsed those words with your statement of "most sensible  
10:45:22 24 statement," correct?

10:45:23 25 A. It is endorsed in the sense of the context of the full report to

10:45:28 1 which I am referring. This is in August of 2010, so it was just  
10:45:34 2 when a lot of things were flying around with accusations. And this  
10:45:37 3 report made some suggestions about the persistence of oil in the  
10:45:42 4 deepwater, which I felt were not -- were exaggerated. And still do.  
10:45:48 5 I think the evidence has suggested that they did.

10:45:51 6           So I was trying to make -- communicate to Mr. Garcia, who  
10:45:55 7 is a fellow commissioner who asked me what did I make of the report,  
10:45:59 8 to say, "Yes," but, you know, you have to understand that these  
10:46:02 9 various processes that you just asked me about are going on, and  
10:46:07 10 these scientists were not taking that into full account, except for  
10:46:11 11 this one quotation.

10:46:12 12 Q. Does that mean when you said, "sensible statement" you thought  
10:46:15 13 it was accurate?

10:46:15 14 A. It is, indeed, that natural processes did transform, dilute,  
10:46:22 15 degrade, and evaporate the components. That's pretty clear.

10:46:27 16 Q. Thank you. 13191.1.4. Do you also write to Mr. Garcia, "Most  
10:46:35 17 of the subsurface oil plume, most discharged more than two months  
10:46:41 18 ago, now has been diluted by several orders of magnitude." Do you  
10:46:46 19 write that in your e-mail to Mr. Garcia?

10:46:48 20 A. I did.

10:46:48 21 Q. Now, the type of oil released in this spill, as we've talked  
10:46:55 22 about some in this case in the opening statement, is considered a  
10:47:00 23 light Louisiana crude oil, correct?

10:47:02 24 A. Correct.

10:47:02 25 Q. And light Louisiana crude oil contains a smaller proportion of

10:47:08 1 chemical components that would be expected to persist in the  
10:47:12 2 environment than oil, like -- which was spilled in the Exxon Valdez  
10:47:19 3 event, correct?

10:47:21 4 A. The components that are enriched in a heavier oil are those --  
10:47:26 5 the large molecules of alkanes, those are tar-like compounds that we  
10:47:33 6 use to pave roads and they persist for a long time. Those are not  
10:47:37 7 the toxic components, though. So it is true that a heavy oil has  
10:47:43 8 more of those compounds which will tend to last around, but the  
10:47:47 9 compounds of concern are the lighter -- particularly the polycyclic  
10:47:53 10 aromatic hydrocarbon which are equally prevalent in both types of  
10:47:56 11 oil.

10:47:57 12 Q. Was the answer to my question "yes"?

10:47:59 13 A. It was -- your question begged an explanation, and that's what I  
10:48:04 14 was trying to give you, sir.

10:48:06 15 Q. I asked you if a smaller proportion of the components would be  
10:48:10 16 expected to persist than the crude oil in the Exxon Valdez spill, is  
10:48:15 17 that answer to that "yes"?

10:48:17 18 A. Yes. And that's because it has more heavy alkanes.

10:48:20 19 Q. Now, let's go to the next issue, which is your characterization  
10:48:29 20 of potential harm. As I appreciate it, you use potential harm when  
10:48:37 21 evidence suggests that there might be actual harm, but it hasn't  
10:48:41 22 been proven yet?

10:48:43 23 A. It hasn't been demonstrated from the standpoint of actually  
10:48:46 24 being observed in effect on the population or in the process. It  
10:48:51 25 can be deduced that it's likely to occur, but it hasn't been. The

10:48:57 1 population process hasn't been assessed at this point.

10:48:59 2 Q. The evidence is in a state where you would say, "I can't say  
10:49:05 3 that the harm has occurred. It is only in the category of a  
10:49:09 4 potential"?

10:49:11 5 A. I'm sorry. Could you repeat the question?

10:49:14 6 Q. That probably wasn't a good question. Let me go to something  
10:49:18 7 else.

10:49:18 8 In the report that you furnished to us, you did not  
10:49:24 9 attempt to quantify the extent of any potential harm that may have  
10:49:30 10 occurred?

10:49:32 11 A. I did not attempt to quantify in terms of the exact size of the  
10:49:38 12 population or, you know, area of coverage or anything, that's true.

10:49:44 13 Q. Nor did you, in your report, attempt to quantify the probability  
10:49:50 14 that any of the potential harms that you identified will occur at  
10:49:54 15 some point in the future. That's not in your report either, is it?

10:49:58 16 A. This is -- these -- you're asking about the harm that I did not  
10:50:02 17 identify, but could potentially occur?

10:50:04 18 Q. I am asking you about those things for which you said, "They  
10:50:07 19 might occur. They're potential." You didn't quantify the  
10:50:15 20 probability that they will emerge as an issue related to the  
10:50:19 21 environment?

10:50:20 22 A. I did not quantify them, but I used my professional judgment  
10:50:23 23 based upon the evidence to say -- to conclude -- draw my conclusion  
10:50:26 24 about whether they were likely or not.

10:50:29 25 Q. Now, I believe you mentioned in your report that your assessment

10:50:37 1 did not involve analyses of the extensive NRD databases, is that  
10:50:44 2 correct?

10:50:45 3 A. That's correct. I did not do that. And for the reasons that I  
10:50:48 4 stated. Dr. Rice, in his attempt to review the expert report of  
10:50:54 5 Dr. Shea, did actually do such an analysis, and that is included in  
10:51:00 6 the round 2 report which -- to which I coauthored.

10:51:04 7 Q. Related to water samples?

10:51:05 8 A. Correct. Water samples and sediment samples.

10:51:10 9 Q. You didn't review the sediment samples yourself, though, did  
10:51:14 10 you?

10:51:14 11 A. I reviewed Dr. Rice's analysis and summary of those samples. I  
10:51:20 12 did not review the original -- we actually -- my laboratory looked  
10:51:24 13 at the data, but, then, by that time, he was going to do an  
10:51:27 14 analysis, so I did not attempt to do it myself.

10:51:30 15 Q. You did not put forward your own analysis of the water or  
10:51:35 16 sediment samples, did you?

10:51:37 17 A. Other than by endorsing Dr. Shea's analysis in a round 2 report,  
10:51:41 18 no, I did not.

10:51:42 19 Q. You believe there's an analysis of sediment samples in the round  
10:51:45 20 2 report?

10:51:46 21 A. I think that actually came later when he delved out more deeply  
10:51:52 22 into it, now that you ask me that specifically; but he did look at  
10:51:55 23 sediment data. I know Dr. Rice did look at sediment.

10:52:00 24 Q. That's in the third round report, correct?

10:52:02 25 A. Yes.

10:52:02 1 Q. And you didn't sign off on the third round report, did you?

10:52:05 2 A. No, I did not.

10:52:05 3 Q. So there is nothing in any of your reports that relates to  
10:52:08 4 sediment data?

10:52:09 5 A. Not that original data. However, there are studies, published  
10:52:14 6 studies that have used some of that data in -- that I did cite and  
10:52:18 7 did use.

10:52:18 8 Q. You didn't reference that in your report, did you?

10:52:20 9 A. Did I specify that these papers used the publicly available --

10:52:27 10 Q. Did you specify anything about sediment in your round 3 report?  
10:52:30 11 Sediment samples?

10:52:35 12 A. I certainly discussed the elevated concentrations of  
10:52:39 13 sediments -- of contaminants and sediments. I discussed  
10:52:46 14 contamination of the oily residue that was deposited on the sea  
10:52:49 15 floor, and I think I probably discussed those issues in all three of  
10:52:52 16 my reports.

10:52:52 17 Q. I'm referring to the sediment samples, the data reflected in the  
10:52:56 18 sediment samples. Did you address that data anywhere in any of your  
10:53:02 19 reports?

10:53:03 20 A. I refer to papers that had data on sediment contamination  
10:53:07 21 levels, and I addressed -- I used those papers, but I did not do --  
10:53:11 22 as you asked me initially, I did not do my own analysis of the  
10:53:15 23 publicly available -- so-called publicly available combined  
10:53:18 24 database.

10:53:19 25 Q. New topic. Population level data where available is an



10:53:27 1 important consideration in evaluating the environmental impact of an  
10:53:31 2 oil spill, correct?

10:53:32 3 A. It is.

10:53:33 4 Q. Now, I would like to ask you, sir, are you aware that there is  
10:53:39 5 extensive environmental data from the *Deepwater Horizon* event that  
10:53:44 6 is available publicly on the Internet and has been published and put  
10:53:51 7 there by the federal government?

10:53:53 8 A. Could you be more specific about which data you refer?

10:53:57 9 Q. Yeah. Let me just ask you about a few. Did you look at any of  
10:54:00 10 the data or information that's publicly available on colonial water  
10:54:04 11 birds in your effort to understand potential impact to the bird  
10:54:09 12 population?

10:54:09 13 A. I did not do my own analysis of those data.

10:54:11 14 Q. Did you do any analysis of the publicly available information on  
10:54:16 15 shore birds when you were looking to formulate your opinions here?

10:54:20 16 A. No, I did not.

10:54:21 17 Q. Same question for the data that's publicly available on beached  
10:54:26 18 birds.

10:54:26 19 A. Other than those combined tables that I showed you, those data,  
10:54:30 20 I used those, but not beyond that.

10:54:33 21 Q. What about publicly available information on turtles? Did you  
10:54:39 22 review any publicly available information there?

10:54:42 23 A. Yes, the combined fish and wildlife collection data is what I  
10:54:47 24 referred to as I described.

10:54:48 25 Q. The table that you discussed earlier?

10:54:49 1 A. That's correct.

10:54:50 2 Q. What about the publicly available data on various fish species  
10:54:56 3 and aquatic organisms?

10:54:59 4 A. I did not do my own analysis of those data.

10:55:02 5 Q. Now, you made reference to some criticisms of Dr. Tunnell with  
10:55:22 6 regard to his analysis of birds?

10:55:27 7 A. I criticized his analysis of the bird population data, correct.

10:55:31 8 Q. Now, will you please confirm for the Court that you did not  
10:55:36 9 review, study, or report on the Audubon Christmas bird survey for  
10:55:42 10 birds in the Gulf of Mexico?

10:55:44 11 A. I did not include that in my initial report, but I did address  
10:55:48 12 the -- Dr. Tunnel's interpretation of those data in my rebuttal.

10:55:54 13 Q. You don't analyze that data yourself though, do you?

10:55:57 14 A. No, but I reviewed his analysis of the data, correct.

10:56:00 15 Q. And you did not analyze yourself the North American breeding  
10:56:10 16 bird survey for birds in the Gulf, did you?

10:56:12 17 A. I did not. I, again, reviewed his analysis of those data and  
10:56:16 18 offered the criticisms that I just reviewed earlier.

10:56:18 19 Q. And you did not do your own analysis of the bird oiling  
10:56:22 20 observation data collected by the United States as part of the  
10:56:26 21 *Deepwater Horizon* environmental investigation, that's true, too,  
10:56:28 22 isn't it?

10:56:29 23 A. Other than represented in those combined compressive database, I  
10:56:34 24 did not.

10:56:34 25 Q. You have not looked at sea turtle necropsy data, have you?

10:56:50 1 A. No, I have not seen the original data. I've seen some reference  
10:56:53 2 to it, but I have not reviewed the actual data.

10:56:56 3 Q. And you have not made any attempt in this case, through your  
10:57:01 4 reports, to quantify the number of turtles, if any, that were oiled,  
10:57:06 5 but not rescued?

10:57:07 6 A. No, other than saying it has to be larger than the number that  
10:57:11 7 were actually taken, that's correct.

10:57:13 8 Q. With regard to the necropsy data, the same is true for the  
10:57:16 9 dolphin information, correct? You haven't reviewed that?

10:57:20 10 A. I haven't reviewed the original data. I did review the summary  
10:57:27 11 of those -- I'm sorry -- no, you're right. I'm thinking of turtles  
10:57:32 12 again. No, I did not.

10:57:33 13 Q. Now, would you agree, sir, that when conducting a thorough  
10:57:38 14 investigation about the impact of oil to species, that if necropsy  
10:57:45 15 data is available and can be reviewed, that it can be helpful to  
10:57:50 16 understanding a potential causal link?

10:57:53 17 A. It can be helpful, but it isn't the only source of information,  
10:57:56 18 that's correct.

10:57:57 19 Q. But for that helpful source, you have not reviewed those  
10:58:02 20 necropsies, right?

10:58:02 21 A. I haven't reviewed all of the original necropsy data, that's  
10:58:07 22 correct.

10:58:07 23 Q. Now, there is information that's available with regard to  
10:58:15 24 visible oiling in the Gulf of Mexico in the weeks and months  
10:58:24 25 following the *Deepwater Horizon* spill, correct?

10:58:27 1 A. Visible oiling, can you be more specific? Surface? Marsh?

10:58:32 2 Q. Visible oiling of surface water. The surface of the water?

10:58:37 3 A. Yes, yes, of course. Yeah. And they include a number of  
10:58:40 4 measurements including -- mostly relied on satellite measurements.

10:58:44 5 Q. Now, you have not done any analysis of the relationship between  
10:58:50 6 visible oiling and the impact of oil on any animal carcasses listed  
10:58:56 7 in the consolidated fish and wildlife report that you have referred  
10:59:02 8 to, correct?

10:59:03 9 A. I did not tend to relate where the oil -- where the birds were  
10:59:07 10 or animals were collected and where the oil was, no, sir, I did not.

10:59:11 11 Q. And you would agree that in the context of understanding impact  
10:59:16 12 that exposure to something that's toxic is an important  
10:59:22 13 consideration?

10:59:24 14 A. Yes.

10:59:24 15 Q. Now, in addition to some of the things we've talked about, you  
10:59:30 16 have not conducted any conducted any independent analysis of fishery  
10:59:34 17 landings data in evaluating potential harm from the spill?

10:59:40 18 A. No, I did not, but I did review Dr. Tunnell's analysis of these  
10:59:44 19 aggregate data.

10:59:45 20 Q. You didn't look at them yourself?

10:59:47 21 A. The data themselves, no. I trusted that he was actually,  
10:59:52 22 accurately representing the averages that he purported to then be.

10:59:56 23 Q. Now, I think we'll hear about this a little later, I am not  
11:00:01 24 going to get into great detail about it. But there are some studies  
11:00:05 25 that you rely on for your opinions that relate to mixtures that are

11:00:10 1 prepared using a technique called LEWAF; is that correct?

11:00:15 2 A. That's correct.

11:00:15 3 Q. And I just want to ask you one question about that. You've not  
11:00:20 4 done any detailed comparison of PAH composition data of field  
11:00:27 5 samples to the LEWAF prepared mixtures, you have not done that?

11:00:32 6 A. I have not done that, but I've certainly reviewed the  
11:00:35 7 controversy among the experts to draw my own conclusions about  
11:00:37 8 whether the use of that method was appropriate for the toxicity  
11:00:42 9 test, and concluded that it was.

11:00:45 10 Q. My question to you is, is have you done a detailed comparison of  
11:00:51 11 the toxicity data from the field to see if it matches to the LEWAF  
11:00:57 12 data, have you done that detailed comparison?

11:00:59 13 A. No, I haven't. But it's not necessary because, because the  
11:01:04 14 field data in terms of exposure actually include identification of  
11:01:11 15 all of the specific compounds, that were actually present. As do  
11:01:17 16 the bioassay data, no matter what the technique used to mix the oil  
11:01:21 17 still have to report the PAHs that were present. So if the PAHs  
11:01:25 18 were present in the test water and also present in the environment,  
11:01:28 19 that's a reasonable replication of the exposure conditions.

11:01:33 20 So I reviewed that from that controversy over mixing  
11:01:37 21 methodology from that perspective of the broader, my expertise as an  
11:01:42 22 ecosystem scientist.

11:01:43 23 Q. TREX 13277.1.1, please. You referenced in your direct  
11:01:51 24 examination some articles that you have written. "The Role of  
11:01:56 25 Ecology in Marine Pollution Monitoring, Ecology Panel Report." Do

11:02:05 1 you recognize that title?

11:02:06 2 A. I do. It's a paper that I and some coauthors wrote as a result  
11:02:11 3 of a workshop. This was about 35 years ago, something of that sort.

11:02:15 4 Q. 13277.1.2. Did you write, sir, "It should be recognized that  
11:02:22 5 'from a strictly biological as well as fisheries point of view it is  
11:02:27 6 the population and not the individual that is important and it is  
11:02:31 7 argued that unless an effect has consequences at the population  
11:02:35 8 level it is insignificant.'" Did you write that, sir?

11:02:38 9 A. I was one of the coauthors of this paper. That segment is an  
11:02:44 10 introductory paragraph. And if you note, as is usual in any kind of  
11:02:50 11 paper where you're setting the stage for your paper, you quote  
11:02:52 12 experts to set the issues before you. So in this paper we were  
11:02:57 13 quoting Dr. McIntyre, the statement about strictly that's his words,  
11:03:03 14 not mine, and we were quoting that to set the stage for our  
11:03:06 15 discussion of the challenge that we always face in trying to relate  
11:03:11 16 observations about impacts on individuals to those on populations.

11:03:15 17 So it was not a conclusion but basically an introductory  
11:03:19 18 statement quoted from another author.

11:03:21 19 Q. Go back to 13277.1.1. I am not sure if I made this point. You  
11:03:31 20 are an author of this article, are you not?

11:03:32 21 A. That's correct.

11:03:35 22 Q. And the statement that I read to the record for the benefit of  
11:03:35 23 Judge Barbier, I read it correctly, did I not?

11:03:37 24 A. You did. And I explained what it meant in the context.

11:03:43 25 Q. We have your explanation, thank you.

11:03:45 1           When you were investigating the environmental effects from  
11:03:47 2 an oil spill, field operations are an essential part of the  
11:03:52 3 assessment, correct?

11:03:54 4 A. It is -- essential, I would say it's a very important part.  
11:04:01 5 Sometimes you don't have the opportunity to make field observations  
11:04:04 6 and you have to draw conclusions from other approaches. So I think,  
11:04:09 7 I would agree that it's very important.

11:04:11 8 Q. I'm sorry, I didn't mean to interrupt you.

11:04:13 9           Would you use the word critical to describe the importance  
11:04:16 10 of field operations as being an essential part of the assessment?

11:04:21 11 A. Well, I don't know. I think it's -- I think critical means that  
11:04:27 12 it is very important. Essential goes a little bit farther. I think  
11:04:32 13 essential is word that alluded to.

11:04:33 14 Q. What's the word you want to use, essential?

11:04:36 15 A. No, you said essential, I would say more critical. Or of great  
11:04:39 16 importance. I don't know.

11:04:41 17 Q. You wouldn't use essential or critical to describe this?

11:04:44 18 A. To describe?

11:04:45 19 Q. To describe that it's -- that field observations are a primary  
11:04:55 20 importance when looking at the effects from an oil spill?

11:04:59 21 A. I would think that they're of great importance, highly  
11:05:02 22 desirable. If you ask me to say what I think, that's what I think.

11:05:06 23 Q. All right. I am going to move on from great importance, thank  
11:05:12 24 you.

11:05:12 25           You also agree that there are limitations to

11:05:16 1 extrapolating toxilogical effects that have been determined in the  
11:05:20 2 laboratory to population effects?

11:05:23 3 A. There are, uh-huh.

11:05:25 4 Q. Because you need to find out if what you're seeing in the test  
11:05:31 5 tube or in the lab is actually occurring in the environment?

11:05:36 6 A. That's true. And that's the same, that's the same issue that  
11:05:39 7 all of us must confront, whether it's doctor you are you'll be  
11:05:44 8 hearing from Dr. Rice; but it's also the assumptions that Dr. Shea  
11:05:47 9 made because he is using test tube or laboratory experiments to draw  
11:05:52 10 conclusions about the effects, or lack thereof, based on the same  
11:05:55 11 evidence and same logic.

11:05:56 12 Q. You agree that there are limitations to extrapolating  
11:06:02 13 toxilogical effects and you agree that population data is important,  
11:06:07 14 those are two givens in terms of trying to understand the  
11:06:10 15 relationship we're talking about here today?

11:06:12 16 A. That's a fair characterization, sir, yes.

11:06:15 17 Q. Thank you. Making a little progress. Thank you.

11:06:17 18 A. Yes.

11:06:18 19 Q. Now, you put up a little earlier some composite pictures of  
11:06:32 20 surface oiling. Do you remember the exhibit that you had up for  
11:06:34 21 that?

11:06:36 22 A. These are pictures of oil on the surface of the sea? I had  
11:06:39 23 several but --

11:06:39 24 Q. Yes. The one that had the, basically, the whole Gulf of Mexico  
11:06:45 25 covered if black, do you remember that one?



11:06:47 1 A. I am not -- you mean these are the maps of the Gulf?

11:06:50 2 Q. The maps, yes.

11:06:51 3 A. I don't think I had anything with the whole Gulf of Mexico  
11:06:54 4 covered in black.

11:06:55 5 Q. Let me ask you a couple of questions. The maps that you showed  
11:06:58 6 to Judge Barbier are based on satellite images, correct?

11:07:03 7 A. The images from the -- the images that I derived were the NOAA  
11:07:10 8 NESDIS, a summary of where cumulative coverage by oil, that's indeed  
11:07:16 9 correct. They were derived largely, if not totally, from  
11:07:18 10 satellites.

11:07:19 11 Q. Gotcha. Was the NESDIS coverage map one of the ones you  
11:07:26 12 reviewed and utilized?

11:07:27 13 A. Yes. It was in my initial report.

11:07:30 14 Q. And do you agree that when we look at those coverage maps that  
11:07:34 15 they should not be interpreted to suggest homogeneous coverage of  
11:07:40 16 oil?

11:07:40 17 A. That's correct.

11:07:40 18 Q. And it's also correct that those coverage maps captures where  
11:07:44 19 oil might have been in an area over the entire life of the spill?

11:07:50 20 A. Where oil was in the area over the entire life of the spill.

11:07:53 21 Q. It's not a picture of something that's at a point in time?

11:07:55 22 A. That's exactly right.

11:07:56 23 Q. And the oil that's in the water is located in bands, it's not  
11:08:04 24 sitting there altogether can you remembering the entire surface?

11:08:07 25 A. That's correct. That's why that footprint is shaded because it

11:08:10 1 shows you the relative frequency or the duration of coverage, with  
11:08:16 2 the lighter areas being covered only for short periods of time and  
11:08:19 3 the darker areas covered for longer periods of time, that's correct.

11:08:23 4 Q. New topic, dispersants. 13284.1.1. Do you see that this is an  
11:08:34 5 e-mail that you wrote to Richard Lazarus on September 18th, 2010?

11:08:39 6 A. I do.

11:08:40 7 Q. And I'll direct your attention to the callout there where you  
11:08:46 8 are saying to Richard that, "He reported that the preponderant view  
11:08:54 9 of the experts was the dispersant use had a significant net  
11:08:58 10 benefit." Do you see that?

11:08:59 11 A. I do.

11:09:01 12 Q. TREX 13183.8.1.

11:09:13 13 A. Can I explain? Again, I was reporting what someone else had  
11:09:16 14 told me, that was not my own conclusion. But if you wanted to ask  
11:09:21 15 me the oil spill commissions conclusions about that, I would be  
11:09:25 16 happy to say.

11:09:26 17 But I don't -- I want to make clear that the Court  
11:09:30 18 understood that that was something I was reporting that I was told.

11:09:33 19 Q. Let's go back to it. TREX 13284.1.1. You see that this is  
11:09:42 20 referring to Bob Spies, a conversation that you had with him?

11:09:46 21 A. Correct.

11:09:48 22 Q. "Just got off the phone with Bob," do you see that?

11:09:50 23 A. I do.

11:09:54 24 Q. And he's been at Dauphin Island on an "NSF-supported National  
11:09:59 25 Center For Ecological Analysis and Synthesis on toxicity meeting

11:10:04 1 (including dispersants)." Do you see that?

11:10:07 2 A. I do.

11:10:07 3 Q. And you were conveying to Richard that, "He reported that the  
11:10:11 4 preponderant view of the experts was the dispersant use had a  
11:10:15 5 significant net benefit."

11:10:15 6 A. That's what Dr. Spies told me, I wasn't at the meeting. But  
11:10:19 7 point in fact, Mr. Lazarus, to whom the e-mail was directed, was the  
11:10:23 8 executive director of the oil spill commission; and we were at the  
11:10:26 9 process, and at that time evaluating the decisions to use of  
11:10:31 10 dispersants. And if you read our report, our report suggests that  
11:10:36 11 the decisions were appropriate.

11:10:37 12 So we're not criticizing the use of the dispersants at  
11:10:40 13 all. And so I relayed this information to Mr. Lazarus as part of  
11:10:44 14 our exchange that would help inform our evaluation in our report,  
11:10:48 15 which actually appeared, that was in September, our report appeared  
11:10:52 16 in January of 2011, which basically concludes that although there  
11:10:57 17 are questions that we need to take into consideration about future  
11:11:00 18 use that we could -- we thought that the government had made the  
11:11:03 19 right decisions on dispersant.

11:11:04 20 Q. When you say that the decisions were appropriate, you are  
11:11:10 21 referring to decisions that were made to utilize dispersants?

11:11:13 22 A. That's correct.

11:11:13 23 Q. And when you think about something being appropriate, do you put  
11:11:17 24 into the mix a risk-benefit analysis?

11:11:20 25 A. I do. And in fact, this involves a comparison of the risk

11:11:26 1 because this does not -- the application of dispersants does not  
11:11:30 2 remove the oil from the sea, it actually puts it into the sea and  
11:11:34 3 keeps it off the land. And so they always involve a trade-off of  
11:11:39 4 understanding what the increased toxic effects in dispersant  
11:11:45 5 application compared to keeping the oil from the land.

11:11:47 6 Q. You do understand that one of the primary goals of the response  
11:11:50 7 was to keep oil off of the sensitive shorelines and marshes?

11:11:53 8 A. I do.

11:11:53 9 Q. Is that part of the risk-benefit analysis that goes into the use  
11:11:57 10 of dispersants?

11:11:58 11 A. It is. But, you know, agencies, and particularly EPA in this  
11:12:03 12 case, had to also consider the risk to the aquatic environment and  
11:12:06 13 that was basically a subject of discussion then. And we came down  
11:12:10 14 on the commission as suggesting that the appropriate decisions were  
11:12:14 15 made.

11:12:15 16 Q. Taking into account the risk benefit?

11:12:17 17 A. Absolutely.

11:12:19 18 Q. That's all I was trying to get to.

11:12:21 19 A. But still the fact of the matter the dispersants were applied,  
11:12:25 20 so my assessment of the harm has to take into account what actually  
11:12:29 21 happened. And indeed the dispersants were applied and had some  
11:12:33 22 consequence.

11:12:33 23 Q. 13183.8.1. Do you see that this is a callout from your report?

11:12:40 24 A. This is a callout -- I can't see -- this is our oil spill  
11:12:44 25 commission report?

11:12:44 1 Q. No, this is an expert report.

11:12:48 2 A. I see.

11:12:48 3 Q. Do you see the portion that I've highlighted there?

11:12:50 4 A. Yes.

11:12:51 5 Q. Do you agree that a chemical dispersant injected where oil  
11:12:55 6 gushed from the wellhead or marine riser or sprayed onto the surface  
11:12:59 7 oil slicks had little toxicity in itself, do you agree with that?

11:13:03 8 A. That's correct. And there is a lot of anxiety over that. And,  
11:13:06 9 in fact, the toxicities associated with the making the oil more  
11:13:11 10 available rather than the dispersants itself. So it's the oil and  
11:13:15 11 the dispersant mixture which produces toxicity rather than the  
11:13:23 12 dispersant.

11:13:24 13 Q. In your report, sir, you do not demonstrate harm to any fish  
11:13:29 14 populations, correct?

11:13:31 15 A. We do not designate actual harm. We do -- I do indicate in a  
11:13:38 16 number of cases potential harm.

11:13:39 17 Q. You described that. Thank you. You have not been able to  
11:13:45 18 actually demonstrate it in the field, correct?

11:13:47 19 A. That's what I said, that's the kind of evidence I would like --  
11:13:51 20 I would expect to have if I was going to designate it actual harm.  
11:13:54 21 I've approached this in a very conservative way.

11:13:57 22 Q. Let's turn to TREX 13287.1.1. I would like to get the title  
11:14:19 23 page of the Fodrie article, please. This is 13287.1.1. Okay.

11:14:37 24 Do you see there I have the title page for the Fodrie  
11:14:40 25 article up?

11:14:40 1 A. I see that.

11:14:41 2 Q. This is one of the studies that you talked about in your direct  
11:14:44 3 examination?

11:14:44 4 A. That's correct.

11:14:45 5 Q. Let's see 13287.8.5. Under -- this is a title to a section  
11:14:57 6 "Factors Dampening Population Level Responses Despite Organismal  
11:15:06 7 Ecotoxicity." Do you see that?

11:15:09 8 A. I do.

11:15:09 9 Q. 13287.8.1. It says here, "many fishes are highly mobile and are  
11:15:1510 likely capable of fleeing oil-affected shore lines." Do you see  
11:15:2011 that?

11:15:2012 A. I see that.

11:15:2113 Q. 13287.8.2. It says, "Furthermore, long-term periodic exposures  
11:15:3014 to hydrocarbons in regions with natural background seepage, such as  
11:15:3515 the northern Gulf of Mexico, may prime adaptive avoidance behaviors  
11:15:3916 or tolerance in resident species." Do you see that?

11:15:4217 A. I do.

11:15:4318 Q. 13287.8.3. "Density mediated responses in vital rates, such as  
11:15:5219 juvenile and adult survival and growth rates, may often be  
11:15:5620 sufficient to overcome the impacts of oil exposure, which may result  
11:16:0021 in little change at the population level." Do you see that?

11:16:0322 A. I see that.

11:16:0423 Q. This is explaining some of the reasons that you might have  
11:16:0924 exposure but not have a decline in the important measurement of  
11:16:1525 population, correct?

11:16:17 1 A. Yes. And if you show me the full paper, you would see that this  
11:16:22 2 paper lines up those reasons why the fact at the individual level  
11:16:28 3 might be not at the population level, those you have given me are  
11:16:33 4 examples.

11:16:33 5 It also discusses equally those reasons why affects might  
11:16:38 6 not be detectable at the population level but still might be --  
11:16:43 7 population level affects might not be demonstrate extra be but  
11:16:47 8 actually occur also. So it's a balanced paper and you're just  
11:16:52 9 showing me one side of the argument, not the other side.

11:16:54 10 Q. Right. Same thing happened when your lawyer was questioning  
11:16:57 11 you, I'm trying to give balance to it now, please, sir.

11:17:01 12 Did I read it right?

11:17:03 13 A. You read -- this statement, you read it right.

11:17:06 14 Q. Yeah. And it is addressing the issue of why there may not be a  
11:17:10 15 population change, even if there has been the presence of  
11:17:13 16 hydrocarbons in an environment; that's true, isn't it?

11:17:15 17 A. That's true. But it also addresses why there may be a  
11:17:19 18 population effect that is not detectable, there are other reasons  
11:17:23 19 why that's the case.

11:17:23 20 Q. This article does not detect the population change, does it?

11:17:27 21 A. And it explains why a population change might be there but not  
11:17:31 22 detectable, that's correct.

11:17:33 23 Q. Will you answer any question, please. Does this article detect  
11:17:37 24 a population change?

11:17:37 25 A. I think I said yes and then I qualified my answer.

11:17:41 1 Q. You say it does detect a population change, or, no, it does not?

11:17:43 2 A. I said, no, it doesn't. But it also describes why there could  
11:17:48 3 be population level effects that are hard to detect in the field.

11:17:52 4 Q. This compensatory process piece that I have put up here next, is  
11:17:57 5 this another reason why populations may do well even if there has  
11:18:02 6 been exposure, "density mediated responses in vital rate, such as  
11:18:06 7 juvenile and adult survival and growth rates, may often be  
11:18:10 8 sufficient to overcome the impacts of oil exposure, which may result  
11:18:13 9 in little change at the population level." Did I read that right?

11:18:16 10 A. You read it right.

11:18:18 11 Q. And as you've talked to us about here today, you've done no  
11:18:25 12 independent analysis of any population change for any fish species,  
11:18:31 13 correct?

11:18:31 14 A. I have not done that myself, correct.

11:18:34 15 Q. Now, you talked a little bit about the fish lesions a little  
11:18:46 16 earlier in your examination today, did you not?

11:18:48 17 A. I did.

11:18:48 18 Q. And one of the things that you didn't mention is that the  
11:18:54 19 article that you referred to, the Murawski report or Murawski  
11:18:59 20 report, explicitly says that it's not been established that any of  
11:19:04 21 the fish lesions that they identified were caused by exposure to oil  
11:19:08 22 from the spill, correct?

11:19:09 23 A. I don't think I drew that conclusion anyway. But that's indeed  
11:19:15 24 what they do, they operate from an abundance of caution and note  
11:19:18 25 that its correlation that the lesions occurred where they did but



11:19:23 1 they couldn't strongly link it with evidence to the spill, that's  
11:19:27 2 correct. Nor could they in that paper link it to the --

11:19:31 3           However, the same animals had high levels of hydrocarbons  
11:19:37 4 in their tissues. What they couldn't say is that there is a cause  
11:19:41 5 between the high levels of hydrocarbon that caused the lesions, that  
11:19:46 6 they stopped short of doing that; but they did note that both of  
11:19:50 7 those phenomena occurred in the same place in the same fish.

11:19:53 8 Q. Let me ask this question cleanly if I can, please. You agree  
11:19:57 9 that it has not been established that any fish lesions referred to  
11:20:02 10 in the Murawski paper were caused by exposure to oil from the spill?  
11:20:06 11 Is that yes or no?

11:20:07 12 A. I think I accept the statement that those authors made that you  
11:20:12 13 just read to me.

11:20:13 14 Q. Thank you. And Murawski is the only study you cite in your  
11:20:20 15 expert reports in support of a claim that some fish may have  
11:20:24 16 developed lesions as a result of the oil spill?

11:20:27 17 A. Right. And that's indeed why I put it in the potential harm  
11:20:31 18 category, not in the actual one.

11:20:33 19 Q. You agree that there is another study that found only one out of  
11:20:39 20 3,100 nearshore fish sampled had any kind of external sore or  
11:20:46 21 lesion, correct?

11:20:47 22 A. That's correct. And the operative term is nearshore where there  
11:20:50 23 wasn't exposure to the fresh oil.

11:20:52 24 Q. You talked about offshore plankton. I'll address a few issues  
11:21:08 25 on that, please. TREN 13183.22.1. This is an excerpt from your

11:21:19 1 report. Do you see there where you write: "Oil Harmed Planktonic  
11:21:24 2 Organisms and Affected Their Food Webs." Do you see where that  
11:21:29 3 starts there?

11:21:29 4 A. Yes, that's the header of that section.

11:21:31 5 Q. Correct. And then if we drop down to the next callout  
11:21:37 6 13183.44.1. Do you write in your expert report, "Plankton  
11:21:42 7 populations no doubt recovered within months, if not sooner."

11:21:46 8 A. That's correct.

11:21:46 9 Q. Sitting here, or at the time of your deposition, you stated the  
11:21:56 10 food web compacts from the incident did not rise to the level of  
11:22:00 11 actual harm.

11:22:04 12 A. I'm sorry, I don't -- could you -- I have to see what you're  
11:22:09 13 saying that I said.

11:22:10 14 Q. Let me pull it up for you. We'll see if we can refresh your  
11:22:14 15 recollection. 54, lines 13 through 25. Let me just read this to  
11:22:25 16 you and then if you have a comment you may make it. "And these  
11:22:28 17 particular food chain consequences we have been discussing are not  
11:22:33 18 discussed in your report." And then you go on to say, "the -- it's  
11:22:38 19 mentioned as -- yet, it's just for due diligence in terms of looking  
11:22:43 20 at all potential things but it didn't -- the evidence in my  
11:22:46 21 estimation, did not rise to the level that I even raised it, you  
11:22:50 22 know, to do actual harm." Is that what you testified to in your  
11:22:53 23 deposition about food chain consequences?

11:22:56 24 MS. ANDRE: I'm sorry, your Honor, this misstatements the  
11:22:59 25 testimony. If you will include more of the deposition page, I think

11:23:01 1 you'll get this question and answer process.

11:23:05 2 THE COURT: Where do you want him to read, following that?

11:23:09 3 MS. HIMMELHOCH: Your Honor, if he can be asked to begin  
11:23:11 4 at line six which clarifies what these refers to on line 13.

11:23:15 5 THE COURT: Line six?

11:23:17 6 MR. BROCK: That's fine. Pull it up.

11:23:20 7 BY MR. BROCK:

11:23:22 8 Q. "In fact, it would require speculation for you to even describe  
11:23:25 9 the consequences of biodegradation of the food chain as a result of  
11:23:29 10 the spill." And you say, "You didn't speculate in the report so I  
11:23:32 11 didn't go there." But then you come down and you talk about food  
11:23:35 12 chain consequences, and you say, "it did not rise to the level that  
11:23:38 13 I even raised it to actual harm." Is that a fair summary of that,  
11:23:42 14 that series of questions?

11:23:44 15 A. I am looking at this testimony, reading the deposition and  
11:23:47 16 trying to recall. I think there was a discussion of biodegradation  
11:23:50 17 and somehow it shifted to food chain harm. And I am trying -- I  
11:23:56 18 don't remember, frankly, the discussion that we had at the time.

11:24:03 19 But what I said in the report, my written report that is  
11:24:06 20 the evidence that I had of actual harm were: One, incorporation of  
11:24:11 21 the oil into the food web; two, the bioaccumulation of PAHs and  
11:24:23 22 plankton; three, the evidence of toxic effects experimentally  
11:24:27 23 determined of Macondo-type oil on planktonic organisms; and four,  
11:24:32 24 also an effect on ciliates that are feeding on the bacteria that  
11:24:38 25 were affected.

11:24:39 1 So in aggregate that's the information that I used to  
11:24:41 2 conclude that there was actual harm.

11:24:44 3 MR. BROCK: Your Honor, I am going to object and move to  
11:24:46 4 strike that answer. He very clearly says here that he did not  
11:24:50 5 speculate in the report on food web consequences. And when we go on  
11:24:57 6 to ask him another question about it, he says, "the evidence in my  
11:24:59 7 estimation did not rise to the level at that time I even raised it  
11:25:03 8 as actual harm."

11:25:04 9 THE COURT: Well you've asked him and he didn't deny what  
11:25:07 10 was in the transcript is accurate. I think he is entitled to  
11:25:11 11 explain what he understood he was talking about and that's where we  
11:25:15 12 are.

11:25:15 13 MR. BROCK: Okay. I think I have his explanation.

11:25:17 14 THE COURT: I deny your motion to strike. So go ahead and  
11:25:20 15 ask another question.

11:25:21 16 MR. BROCK: All right. Thank you, your Honor.

11:25:24 17 BY MR. BROCK:

11:25:27 18 Q. Corals. You have no direct evidence studying corals, do you?

11:25:31 19 A. Did I study myself?

11:25:33 20 Q. Yes.

11:25:33 21 A. No, I have not studied.

11:25:35 22 Q. In your report you discuss impact to coral colonies only at  
11:25:40 23 three sites on the floor of the Gulf of Mexico, correct?

11:25:43 24 A. Those were the three sites that the colonies existed and were --  
11:25:48 25 damage was documented, correct.

11:25:49 1 Q. Correct. But I am just confirming with you that the only items  
11:25:55 2 that are listed in your expert reports are "impact coral colonies at  
11:26:02 3 three sites," we're going to talk about them, that's what you say?

11:26:06 4 A. That's what the literature has revealed to this point in time.  
11:26:10 5 I can't tell you if there were other sites that will ultimately be  
11:26:13 6 described, I have no idea, but the ones that have been reported in  
11:26:16 7 the literature --

11:26:16 8 Q. We can only talk about what's in your report.

11:26:18 9 A. And that's based on the literature, that's correct.

11:26:21 10 Q. Now, if we go to 13183.26.1. And this is the first item you  
11:26:35 11 list in your report, and it's talking about coral inhabiting the  
11:26:38 12 hard substrates about 11 kilometers or six miles from Macondo well  
11:26:46 13 were observed to be covered by flocculent material. Do you see  
11:26:50 14 that?

11:26:50 15 A. That's correct.

11:26:50 16 Q. That's actually having some kind of --

11:26:53 17 A. Correct.

11:26:53 18 Q. -- discoloration or oil residue or something like that on the  
11:26:58 19 coral, right?

11:26:59 20 A. That's correct.

11:26:59 21 Q. So that's one site.

11:27:02 22 A. That was the first study of several studies that this team had  
11:27:05 23 published, and that was initially on the one site but then they  
11:27:09 24 reported on two other sites.

11:27:10 25 Q. Now, if we look at 13195.1.1, do you see that this is -- you see

11:27:21 1 that this is the white paper?

11:27:22 2 A. Right.

11:27:23 3 Q. Do you see that?

11:27:24 4 A. I did.

11:27:24 5 Q. And you see what I've called out there, "Healthy coral  
11:27:28 6 communities were observed at all sites greater than 20 kilometers  
11:27:34 7 from the Macondo well, including seven sites previously visited in  
11:27:38 8 September of 2009, where the corals and communities appeared  
11:27:42 9 unchanged."

11:27:44 10 A. That's correct.

11:27:45 11 Q. That was also written, correct?

11:27:47 12 A. That's correct. And that was the first paper, and they -- I've  
11:27:50 13 actually one of the sites that they since respected on is a little  
11:27:54 14 bit further away, 20 kilometers away. And mind you, the other sites  
11:27:58 15 that they looked at and found no harm, many of them were hundreds of  
11:28:02 16 miles away.

11:28:02 17 Q. Sir, we have limited time. I'm asking you about the white study  
11:28:06 18 now, not the ones we're going to talk about in a few minutes. Would  
11:28:10 19 you please focus on that?

11:28:10 20 A. I'll be happy to.

11:28:12 21 Q. In the white study I have read to you the findings from that  
11:28:17 22 study about all sites greater than 20 kilometers, correct?

11:28:26 23 A. Those previous sites that they said that they looked at, again,  
11:28:31 24 quite removed from the well, did not show damage.

11:28:33 25 Q. Now, the second study that you refer to is the Fisher study,

11:28:40 1 correct?

11:28:41 2 A. Well, there are several Fisher studies, but, yes.

11:28:44 3 Q. One of them is the Fisher study. And in the Fisher study, you  
11:28:51 4 have one area of coral that is six kilometers to the south of the  
11:28:57 5 Macondo wellhead, and, I think, you referred to the other is about  
11:29:01 6 22 kilometers from the wellhead, correct?

11:29:03 7 A. That's correct, uh-huh.

11:29:05 8 Q. And with regard to the site that's about 22 kilometers from the  
11:29:15 9 Macondo wellhead, do you remember that's Lease Block 344?

11:29:19 10 A. I don't remember the number, but I take your word for it.

11:29:22 11 Q. Do you remember that at that site the Fisher paper characterizes  
11:29:25 12 the injury to the coral as largely minor?

11:29:29 13 A. I would have to look at the source again, but I knew they talked  
11:29:35 14 about variations in the level of impact. But I don't remember  
11:29:38 15 precisely that description of that site.

11:29:41 16 Q. I don't have that paper in my outline, but let me pull up an  
11:29:46 17 excerpt from your deposition 134, 16 to 20. See if this refreshes  
11:29:56 18 your recollection. "My question to you is just that these authors  
11:30:00 19 characterized the impact at Lease Block MC 344 as largely minor."  
11:30:05 20 And did you answer, "That's what they wrote".

11:30:08 21 A. Yeah, of course, I had the paper there and the exhibit before  
11:30:11 22 me.

11:30:11 23 Q. Now, one final paper on coral. 13275.1.1. This is a second  
11:30:28 24 paper by Fisher, is it not?

11:30:30 25 A. Fisher, et al, correct.

11:30:32 1 Q. And the third paper that you refer to in your expert report?

11:30:34 2 A. Correct.

11:30:35 3 Q. And if we turn over to 13275.3.1, do you see that they say,  
11:30:45 4 "Furthermore, colonies observed with low levels of floc on their  
11:30:49 5 surface in 2010 (less than 20 percent coverage) were likely to  
11:30:54 6 exhibit, apparently, complete recovery of the floc covered branches  
11:30:59 7 by March of 2012." Do you see that?

11:31:02 8 A. That's what they wrote.

11:31:03 9 Q. Is that a return to sites that they had been to before that they  
11:31:07 10 reported on?

11:31:07 11 A. I believe that's -- that would be my reading of it, correct.

11:31:10 12 Q. Now, you didn't reference shrimp specifically in your direct  
11:31:20 13 examination, but it's true, is it not, that there are a number of  
11:31:25 14 papers that demonstrate that there is no evidence of changes in  
11:31:31 15 shrimp abundance or mortality from the Gulf of Mexico spill?

11:31:37 16 A. I am aware, of course, Dr. Tunnel's analysis to that effect, and  
11:31:41 17 I am aware of one other paper, but I don't know other papers that  
11:31:45 18 have concluded that. There's one paper that compared two sites in  
11:31:50 19 Louisiana, one that received oil and not, and didn't find a negative  
11:31:55 20 effect on those abundances, that's correct.

11:31:58 21 Q. Do you remember that the Rozas paper found there was no direct  
11:32:01 22 evidence of changing in shrimp abundance or mortality?

11:32:03 23 A. Yes. Those were based upon not broad surveys, but that was the  
11:32:08 24 paper that observed a difference in growth rate and shrimp living  
11:32:13 25 near marshes that were oiled compared to those that weren't. And



11:32:16 1 they did -- basically, couldn't find -- they didn't do a broad  
11:32:19 2 analysis, but they -- when they described that, they said, "But  
11:32:22 3 there was no evidence that those populations had been depressed,"  
11:32:26 4 that's correct.

11:32:26 5 Q. Thank you. Now, there's a second article that we can talk  
11:32:30 6 about, which is the van der Ham article. You're familiar with that  
11:32:34 7 one, too, aren't?

11:32:35 8 A. Yes.

11:32:36 9 Q. 13289.1.1. And this study performed both a large scale and a  
11:32:46 10 small scale analysis of shrimp of two of the heavily impacted areas  
11:32:51 11 in Barataria Bay compared with two minimally impacted areas in  
11:32:56 12 Vermilion Bay, correct?

11:32:58 13 A. Correct.

11:32:58 14 Q. This is the one you were referring to a minute ago?

11:33:02 15 A. That's correct.

11:33:02 16 Q. Let's go to 12389.3.1. There were two analyses done, correct,  
11:33:09 17 there was a large scale and a small scale, correct?

11:33:13 18 A. That's correct.

11:33:13 19 Q. For the small scale analysis, 219,000 shrimp were collected from  
11:33:20 20 1,617 trawls. Do you see that?

11:33:22 21 A. I do.

11:33:22 22 Q. And then if we go to, just move over to 13289.3.5. For the  
11:33:37 23 large scale analysis, two million shrimp were collected from 30,000  
11:33:41 24 trawls. Do you see that?

11:33:43 25 A. I do.

11:33:43 1 Q. And if we go 13289.7.1, "The finding is that a consistent  
11:33:50 2 pattern emerges from our two analyses. The abundance of both brown  
11:33:54 3 and white shrimp was significantly higher after the spill occurred."

11:33:58 4 Do you see that?

11:33:59 5 A. I do.

11:33:59 6 Q. This study also finds that the size of brown shrimp in any of  
11:34:05 7 the basins did not significantly differ after the spill compared  
11:34:09 8 with before the spill in either the 2010, 2011 or 2012 classes,  
11:34:16 9 correct?

11:34:17 10 A. Correct.

11:34:17 11 Q. And in this study, the size of post spill shrimp was  
11:34:22 12 significantly larger in both affected and minimally affected basins,  
11:34:28 13 correct?

11:34:28 14 A. That's correct.

11:34:29 15 Q. Oysters. In your round 1 report, you acknowledge that the  
11:34:43 16 causes of oyster declines in the Gulf are not resolved?

11:34:46 17 A. That's correct.

11:34:46 18 Q. And that's what you have said today?

11:34:48 19 A. That's correct.

11:34:49 20 Q. You agree that there is no evidence, published evidence of  
11:34:59 21 elevated levels of PAHs in oyster tissue in the Mississippi sound  
11:35:05 22 during and after the spill?

11:35:08 23 A. I did read that paper. That's correct, they found no evidence  
11:35:12 24 in that part of Mississippi sound, that's correct.

11:35:13 25 Q. You also said that in your round 1 report?

11:35:16 1 A. I did.

11:35:16 2 Q. Trying to move fast. Dolphins. If we could have TREX

11:35:32 3 12078.1.1, please. Can we call out -- let me just ask a couple of  
11:35:43 4 questions.

11:35:43 5 I know this is hard to read, but is this the chart that  
11:35:48 6 you were looking at earlier in your direct examination?

11:35:51 7 A. Yes, it is. And I think Ms. Andre showed that and then showed a  
11:35:56 8 summary of it. Same chart.

11:35:58 9 Q. Right. So if we look at 13183.37.1 -- I'm sorry. 12078.1.5.  
11:36:24 10 I'm trying to call up the information related to dolphins, please.  
11:36:30 11 Oh, boy.

11:36:30 12 Can you see there at the top dolphins?

11:36:32 13 A. It says, "Mammals," but it includes dolphins, but virtually all  
11:36:38 14 of them were dolphins, bottlenose dolphins.

11:36:42 15 Q. There is a table there for dolphins right there in the middle  
11:36:46 16 that says, "Collected dead." Do you see that?

11:36:48 17 A. Correct.

11:36:48 18 Q. Just leave it like it is, and we'll just try to work with it  
11:36:52 19 real quick. Just like you had it before.

11:36:56 20 And we see here for dolphins, 157 are collected dead and  
11:37:03 21 the table reflects that ten of those were visibly oiled?

11:37:10 22 A. That's correct.

11:37:11 23 Q. You have done no analysis looking at the relationship between  
11:37:17 24 visible oiling and the impact on oil on any of the animals, true?

11:37:22 25 A. You're referring to animals; meaning, the dolphins?

11:37:25 1 Q. The dolphins.

11:37:26 2 A. Yes, I have not, that's true. And the point I made in the  
11:37:32 3 report is that visible oiling of an organism that doesn't have  
11:37:36 4 feathers or something to trap oil doesn't mean -- lack of oiling  
11:37:40 5 doesn't mean that they were not exposed to oil.

11:37:42 6 Q. And presence of oil doesn't mean that the oil was a contributing  
11:37:46 7 factor to the death?

11:37:47 8 A. Absolutely.

11:37:47 9 Q. Correct. Thank you.

11:37:49 10 Now, you referenced earlier that there was activity  
11:37:53 11 going on with the dolphin population that predated the spill. Do  
11:37:57 12 you remember that?

11:37:57 13 A. I do.

11:37:58 14 Q. And you were referring to what we have referred to as a UME,  
11:38:06 15 correct?

11:38:06 16 A. Unusual mortality event, correct.

11:38:09 17 Q. And the marine mammal stranding data indicated a prolonged  
11:38:15 18 unusual mortality event for bottlenose dolphins had been occurring  
11:38:21 19 for months prior to the *Deepwater Horizon* spill, correct?

11:38:25 20 A. For a few months. It began earlier in -- earlier in 2010, but  
11:38:31 21 it did predate the April explosion and blowout.

11:38:34 22 Q. I believe you told us in your deposition that the mortality  
11:38:37 23 event that you refer to began in February of 2010.

11:38:42 24 A. I think that's what I summarized and reported, right. As long  
11:38:49 25 as you say, "In advance of the blowout."

11:38:51 1 And the investigators are still working on this, but  
11:38:54 2 there's at least one paper that looks at this phenomenon in terms of  
11:38:59 3 how it plays with the oil spill, which suggests that because that  
11:39:02 4 was a very cold winter, there was higher mortality, particularly of  
11:39:06 5 juvenile, of small and abortions of fetuses of dolphins. And the  
11:39:15 6 authors -- the scientists basically, then, describe how that could  
11:39:18 7 set the conditions of making them more susceptible, potentially more  
11:39:23 8 susceptible to other impacts such as the oil spill.

11:39:25 9 Q. We're in 2015 now and no determination has been made that  
11:39:29 10 Macondo oil caused or contributed to the deaths of any of the  
11:39:33 11 dolphins, correct?

11:39:34 12 A. I haven't seen a formal determination of that, that's correct.

11:39:37 13 Q. You cannot report on that today?

11:39:39 14 A. I cannot.

11:39:40 15 Q. Sargassum, your report does not quantify the amount of sargassum  
11:39:47 16 that was impacted by the oil spill, correct?

11:39:49 17 A. I don't think I have that in the report, but if we wanted to go  
11:39:52 18 back to the original paper that I cited, I probably could get that,  
11:39:56 19 some sort of the quantitative information. It's in that report.

11:40:00 20 Q. I'm trying to focus, now, on what's in your report. That's what  
11:40:02 21 we're limited to. It's not in your report?

11:40:05 22 A. The quantification, no.

11:40:06 23 Q. Correct. And you've not even done the analysis that would even  
11:40:10 24 allow you to quantify the extent of the sargassum injury, correct?

11:40:13 25 A. I reviewed the analysis of the authors who wrote the paper when

11:40:18 1 I read and reviewed the paper.

11:40:21 2 Q. But no independent analysis of that?

11:40:23 3 A. That's correct.

11:40:24 4 Q. Now, you know, do you not, that it's been reported that  
11:40:31 5 beginning in July rescuers were founding the sargassum mats not  
11:40:36 6 blackened but clean and teeming with food and with them turtles free  
11:40:42 7 of oil or so lightly oiled they could not -- they could be cleaned  
11:40:47 8 and released on the spot?

11:40:49 9 A. Well, I don't have a source of information for that, only what  
11:40:52 10 you just told me.

11:40:53 11 Q. Let's look at TREX 13276.3.1. First of all, do you know Brian  
11:41:01 12 Stacy of NOAA?

11:41:02 13 A. I don't know him.

11:41:04 14 Q. Do you see here where -- do you have this information available  
11:41:09 15 to you that Brian Stacy is saying that rescuers have found sargassum  
11:41:16 16 mats not blackened but clean and teeming with food and with them,  
11:41:22 17 turtles free of oil?

11:41:23 18 A. I don't. If you could tell me what the document is, I might  
11:41:26 19 remember reviewing it, but I don't, frankly, recognize it.

11:41:29 20 Q. That's fine. We'll move to the next point.

11:41:33 21 Now, I'll go to your report and see if this helps.

11:41:38 22 TREX 13183.19.1. This is a callout from your report. Do you see  
11:41:46 23 that?

11:41:46 24 A. I do see it.

11:41:49 25 Q. "Follow-up aerial surveys in 2011 and 2012 documented a four

11:41:54 1 fold increase in sargassum abundance over 2010 levels." Do you see  
11:41:59 2 that?

11:42:00 3 A. That I do see, and I mentioned that in my direct that Ms. Andre  
11:42:07 4 walked me through.

11:42:07 5 Q. You say that that reflects that this is not a long lasting  
11:42:11 6 issue, correct?

11:42:11 7 A. That is not, with respect to the sargassum itself. And I think  
11:42:15 8 I also said that any year class loss or effect on population that  
11:42:20 9 would have depended on the sargassum that year. I can't tell you  
11:42:23 10 what effect that might have in the long run. But for the sargassum  
11:42:26 11 itself, it recovered.

11:42:27 12 Q. The sargassum recovered and you can't speak to any injury to the  
11:42:31 13 turtle as a result of that?

11:42:32 14 A. Other than the one factor I consider with a lot of other  
11:42:35 15 factors.

11:42:36 16 Q. Now, with regard to turtles, you are aware, are you not, that  
11:42:41 17 there were 536 turtles that were collected alive. I think that was  
11:42:45 18 on the chart that you put up.

11:42:47 19 A. I think that's the right number.

11:42:48 20 Q. And of the 536 turtles that were collected alive, the chart that  
11:42:52 21 you showed to Judge Barbier earlier today reflected 469 of them were  
11:42:59 22 rehabilitated and released back into the wild?

11:43:01 23 A. That's correct.

11:43:01 24 Q. And you would consider that to be an excellent program for  
11:43:08 25 environmental protection?

11:43:10 1 A. I didn't say that. I said it was -- I think when I responded to  
11:43:14 2 that, I said that was a good thing to save those turtles, but it  
11:43:19 3 also indicated to me that there were probably many more turtles out  
11:43:22 4 there, when they were collecting these young turtles, who were not  
11:43:26 5 discovered who were exposed to conditions.

11:43:28 6 Q. I'm asking you a different question. Of the ones that were  
11:43:31 7 collected --

11:43:33 8 THE COURT: Mr. Brock, you don't have the -- is the mic  
11:43:35 9 on? It doesn't sound like it's on. For some reason, when you  
11:43:39 10 walked away --

11:43:44 11 MR. BROCK: I'll just stay here.

11:43:47 12 THE COURT: I didn't even realize it wasn't on the whole  
11:43:49 13 time.

11:43:50 14 MR. BROCK: I thought everybody could hear me. I'll keep  
11:43:52 15 going.

11:43:53 16 THE COURT: I'm thinking about the other courtroom.

11:43:55 17 MR. BROCK: Yes, sir. Thank you. I apologize.

11:43:59 18 BY MR. BROCK:

11:44:00 19 Q. For the turtles that were collected, the 536, the fact that 469  
11:44:08 20 were rehabilitated and returned to the environment was a good thing?

11:44:14 21 A. Reduced the mortality. You have to understand, when you ask a  
11:44:24 22 scientist about a good thing, it's a value judgment.

11:44:26 23 Q. Just try to stick with the question because I am really trying  
11:44:28 24 to get through, sir, please.

11:44:31 25 A. Okay.



11:44:31 1 Q. Now, the tables also reflect that there were 613 turtle  
11:44:39 2 carcasses that were collected; is that right?

11:44:42 3 A. I believe that's the number. I'll take your word for it.  
11:44:45 4 Sounds about right.

11:44:45 5 Q. And again, in that area, there were only 18 that were visibly  
11:44:54 6 oiled?

11:44:56 7 A. Correct.

11:44:56 8 Q. And if we look a little further, if we go to your expert report,  
11:45:00 9 13183.19.2, there were a number of reasons for increased strandings  
11:45:09 10 or deaths of turtles that were under investigation, including  
11:45:14 11 fishing activities that resulted in by catch, correct?

11:45:19 12 A. Those were among the reasons under investigation, that's  
11:45:22 13 correct. By toxins and harmful algal blooms were other things being  
11:45:29 14 looked at.

11:45:30 15 Q. Sure. You're aware of Dr. Lubchenco's report about the analysis  
11:45:35 16 of the turtles that were collected and were dead, correct?

11:45:38 17 A. Yes. I was asked about this in my deposition, and I did see the  
11:45:42 18 document at that time and had a chance to look at it.

11:45:44 19 Q. I'm going to ask you about it again. TREX 12080.1.1. Is this  
11:45:53 20 the article that you were shown at your deposition?

11:45:56 21 A. This is an article that's basically a page-and-a-half. Sort of  
11:45:58 22 a summary, a public statement that Dr. Lubchenco made.

11:46:02 23 Q. She is the under secretary for Oceanic and Atmospheric and NOAA  
11:46:07 24 administrator?

11:46:08 25 A. She was at the time, correct.

11:46:08 1 Q. TREX 12080.1.2. She writes, "Most of the dead stranded turtles  
11:46:17 2 had no observable oil on their bodies and were in good health prior  
11:46:21 3 to their death. Necropsies, autopsies on animals, on more than half  
11:46:27 4 of the 600 carcasses point to the possibility that a majority may  
11:46:30 5 have drowned in fishing gear." Was that her conclusion in this  
11:46:33 6 article?

11:46:34 7 A. That's -- once I was asked about this, I actually had to look at  
11:46:39 8 the full article. And the article is some statements she is making  
11:46:43 9 in order to encourage people to think about other steps for turtle  
11:46:47 10 conservation.

11:46:48 11 So, as a scientist, I immediately wanted to see the data  
11:46:51 12 for this, and I couldn't find it, other than in the federal register  
11:46:55 13 report which actually talks about -- uses some of the same words  
11:46:59 14 about the fact that they were -- they might have been drowned. But  
11:47:02 15 it talks about animals collected over a much longer period than just  
11:47:07 16 during the spill.

11:47:07 17 So I appreciate what she is saying, but I don't see this  
11:47:10 18 as evidence that the animals during the spill were effected by  
11:47:15 19 drowning, in part, because there was a closure. There was a  
11:47:19 20 regional closure that they didn't -- prevented any trawling during  
11:47:23 21 that time. So it's hard for me to imagine that they were dead  
11:47:27 22 because of trawling when it was not taking place.

11:47:29 23 Q. Someone who actually did the investigation said something  
11:47:33 24 different than that, didn't they?

11:47:34 25 A. Dr. Lubchenco.

11:47:38 1 Q. Yes.

11:47:39 2 A. She didn't do the investigation. She is the senior  
11:47:42 3 administrator.

11:47:42 4 Q. When you wanted to see some data, you didn't have any trouble  
11:47:45 5 finding it, did you? When you wanted to see the data about these  
11:47:49 6 turtles, you didn't have any trouble finding it, did you?

11:47:51 7 A. Well, only in the document, the federal register document, which  
11:47:56 8 is putting in place some new regulations for shrimping activities  
11:48:00 9 after the Macondo incident.

11:48:02 10 Q. Couple of questions on the shoreline. I'm getting close to the  
11:48:14 11 end. You referenced an article by Jackie Michel. Do you remember  
11:48:20 12 that?

11:48:20 13 A. I do.

11:48:20 14 Q. 12199.1.1, do you see this as an article by Jackie Michel and  
11:48:31 15 others that you cite, and you cite this in your expert report, do  
11:48:35 16 you not?

11:48:35 17 A. Yes, I do.

11:48:36 18 Q. If we go to 12199.1.2. Do you see this refers, "The SCAT  
11:48:43 19 process is a well established and internationally recognized  
11:48:46 20 component of spill response in use since the Exxon Valdez spill."  
11:48:51 21 Do you see that?

11:48:52 22 A. That's correct. For shoreline assessment and treatment, that's  
11:48:55 23 right.

11:48:55 24 Q. Do you agree that over 31,000 kilometers of total shoreline were  
11:49:08 25 surveyed as part of the SCAT process?

11:49:10 1 A. I don't remember the number offhand. I know a very large area,  
11:49:14 2 length of shoreline was surveyed to make sure they weren't missing  
11:49:19 3 oil that was there.

11:49:20 4 Q. You do agree that a massive effort was expended to remove  
11:49:24 5 stranded oil from the shoreline and the marshes?

11:49:25 6 A. I do.

11:49:26 7 Q. And you agree that this reduced the potential for oil to be  
11:49:31 8 retransported to shorelines not yet affected or cause injury in the  
11:49:35 9 area where they were located?

11:49:36 10 A. I do.

11:49:37 11 Q. Do you agree that of the -- I'll just keep going.

11:49:56 12 I have one more topic, please. Birds. TREX 12078.1.2.

11:50:24 13 The table on birds that you reviewed shows that the only option  
11:50:32 14 regarding oiling status were visibly oiled, no visible oil, and  
11:50:37 15 pending, right?

11:50:39 16 A. That's, at least, what's represented in the table. I don't know  
11:50:42 17 whether they had any categorization other than that, other than  
11:50:45 18 what's represented here.

11:50:46 19 Q. You have no basis for saying anything else, do you?

11:50:49 20 A. No -- I mean, there might have been field notes that described  
11:50:52 21 the degree of oiling, but I don't know whether that's the case  
11:50:55 22 because I am basically, starting point of my analysis was this  
11:50:59 23 table.

11:50:59 24 Q. Do you remember testifying that, at your deposition, that if the  
11:51:04 25 government produced a 30(b)(6) witness who testified that any degree

11:51:08 1 of oiling would qualify an animal as visibly oiled, you would defer  
11:51:13 2 to that testimony?

11:51:14 3 A. Yes.

11:51:15 4 Q. Do you want to see the testimony or do you accept --

11:51:20 5 A. I remember that. And I think there was a deposition of a  
11:51:27 6 government witness who testified that if they saw that, any evidence  
11:51:31 7 of oil, they would consider it oiled.

11:51:34 8 Q. That was Mr. Houston?

11:51:35 9 A. That's correct.

11:51:3510 Q. Now, you're aware that BP funded rehabilitation and  
11:51:3911 stabilization centers to rehabilitate birds that were potentially  
11:51:4312 impacted by the spill?

11:51:4413 A. I did. In fact, I visited one of them.

11:51:4614 Q. You're aware that birds that were not oiled, but were injured  
11:51:5215 were taken to those centers and treated?

11:51:5516 A. Yes.

11:51:5517 Q. And that during the course of the program, around 1,200 birds  
11:52:0318 were rehabilitated and released to the environment?

11:52:0519 A. I think that number is about what I recollect.

11:52:0820 Q. Now, you're aware that both the response efforts and the NRDA  
11:52:2821 devoted significant resources to searching for and collecting bird  
11:52:3222 carcasses, correct?

11:52:3323 A. Yes.

11:52:3324 Q. And you make no effort in this case, through your report or your  
11:52:3725 testimony, to speak to the quantification of birds that were injured

11:52:45 1 or killed as a result of exposure to oil?

11:52:48 2 A. Other than to opine that that they could not have collected all  
11:52:56 3 of the birds that were injured.

11:52:57 4 Q. That's as far as you can go with that?

11:52:59 5 A. That's correct.

11:53:00 6 MR. BROCK: I think that's all I have, your Honor. Thank  
11:53:02 7 you.

11:53:02 8 THE COURT: All right. Redirect. We found out that  
11:53:21 9 Mr. Brock usually doesn't need the mic.

11:53:28 10 MS. ANDRÉ: Very briefly, your Honor.

11:53:31 11 REDIRECT EXAMINATION

11:53:31 12 BY MS. ANDRE:

11:53:31 13 Q. Dr. Boesch, in response to a question by BP, you indicated that  
11:53:35 14 you endorsed the analysis of Dr. Shea in your round 2 report. Did  
11:53:40 15 you intend to refer to Dr. Shea in that answer or did you, perhaps,  
11:53:45 16 mean Dr. Rice?

11:53:45 17 A. I don't remember the question, but I certainly do not endorse  
11:53:49 18 the analysis of Dr. Shea. I have some severe criticisms of it.

11:53:53 19 Q. Just a clarifying question. Thank you.

11:53:55 20 Now, you were also asked about the unusual mortality  
11:53:59 21 event. To your knowledge, has that analysis of that event  
11:54:03 22 concluded?

11:54:03 23 A. No, it's ongoing as best I know.

11:54:05 24 Q. Do you know whether or not the unusual mortality event is also  
11:54:09 25 continuing?

11:54:10 1 A. Well, it's been reduced, but I think it went into the next year  
11:54:14 2 to be sure. I don't know how long it extended, but there was -- it  
11:54:18 3 expanded -- an extended period of unusual mortality that went into,  
11:54:21 4 at least, 2011. May have gone into 2012. I haven't followed it in  
11:54:26 5 terms of the most recent status.

11:54:28 6 Q. You were also asked about the comprehensiveness of SCAT surveys.  
11:54:34 7 In your opinion, would these surveys have identified all of the oil  
11:54:37 8 that poses any risk to the ecosystem?

11:54:41 9 A. No. Because it's intended as a survey to help direct where the  
11:54:47 10 cleanup is intended. And so there may be nooks and crannies,  
11:54:52 11 particularly in marshes, that haven't been surveyed. And the  
11:54:55 12 characterization of a broad area of coast would be adequate for the  
11:54:58 13 cleanup approach, but not for the assessment of damages.

11:55:02 14 In addition to that, that was done during the response,  
11:55:06 15 and so since then there's been kind of remobilization and moving of  
11:55:12 16 the oil that Mr. Brock asked me about because of the tides that came  
11:55:18 17 up, storms that came up that spread it out.

11:55:20 18 Also, the fact that it relies on visible observation  
11:55:25 19 rather than chemical determination.

11:55:26 20 Q. Last question. BP's asked you a lot of questions regarding  
11:55:32 21 dilution, dilution does not remove oil from the environment, does  
11:55:35 22 it?

11:55:36 23 A. No. It can reduce the concentrations but it doesn't remove --  
11:55:41 24 that dilution alone does not remove the oil from the environment.

11:55:45 25 MS. ANDRE: Thank you very much, Dr. Boesch. I have no

11:55:47 1 further questions.

11:55:48 2 THE COURT: All right. Thank you, sir.

11:55:50 3 THE WITNESS: Thank you, sir.

11:55:51 4 THE COURT: All right. It's just about noon so let's just  
11:55:53 5 recess now for lunch until 1:00 P.M.

11:55:56 6 THE DEPUTY CLERK: All rise.

11:55:57 7 (WHEREUPON, A LUNCH RECESS WAS TAKEN.)

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REPORTER'S CERTIFICATE

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          /s/ Karen A. Ibos          

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Karen A. Ibos, CCR, RPR, CRR, RMR

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Official Court Reporter

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