IN THE CIRCUIT COURT OF THE FIRST CIRCUIT

STATE OF HAWAI'I

HAWAII UNITES, a 501(c)(3) nonprofit corporation; Tina Lia, an individual, Plaintiffs, vs. BOARD OF LAND AND NATURAL RESOURCES, STATE OF HAWAI'I, and DEPARTMENT OF LAND AND NATURAL RESOURCES, STATE OF HAWAI'I, Defendants. and AMERICAN BIRD CONSERVANCY, Defendant-Intervenor	) CIVIL NO. 1CCV-23-0000594

TRANSCRIPT OF AUDIO RECORDING

Plaintiffs' Motion Temporary Restraining Order for Preliminary Injunction

BEFORE HONORABLE JOHN TONAKI, JUDGE

Friday, July 21, 2023

Day 1, Pages 1 through 214

TRANSCRIBED BY: MARY ANNE YOUNG, RPR, CSR No. 369

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I N D E X

EXHIBITS

ADMITTED INTO EVIDENCE

PLAINTIFFS' EXHIBITS

NUMBER	RECEIVED
1	6
10	107
12	71
13	99
14	63
15	147

DEFENDANTS' EXHIBITS

NUMBER	RECEIVED
1 to 10	7
17	6
24	6
26	6

(Beginning of audio and video recording)

THE BAILIFF: All rise. The Circuit Court of the First Circuit is now in session, the Honorable John Tonaki presiding.

You may be seated.

Calling Civil Number 1CCV-23-0000594, Hawaii Unites, et al, versus the DLNR, et al, for Plaintiffs' Motion Temporary Restraining Order for the Preliminary Injunction.

Appearances please, starting with the Plaintiff?

MR. VANDEVEER: Good morning, your Honor. Tim Vandeveer and Margaret Wille on behalf of Plaintiffs Hawaii Unites and Tina Lia, and Ms. Lia is also joining us in --

JUDGE TONAKI: Good morning.

MR. VANDEVEER: -- court this morning.

MS. STEED: Good morning, your Honor. Deputy Attorneys General Miranda Steed and Danica Swenson appearing on behalf of the State.

MS. SWENSON: Good morning.

JUDGE TONAKI: Good morning.

MS. PHILLIPS: Aloha. Good morning. Maxx Phillips and David Kimo Frankel on behalf of Intervenor

Defendant American Bird Conservancy.

JUDGE TONAKI: Good morning.

MR. FRANKEL: Good morning.

JUDGE TONAKI: Okay. Um, the -- there's been a stipulation filed regarding certain exhibits, so are the parties asking that these be received in evidence?

MR. VANDEVEER: Yes, your Honor.

JUDGE TONAKI: Okay. So -- so Plaintiffs' Exhibit 1 will be received in evidence as well as Defendants' Exhibits 17, 24 and 26.

(Plaintiffs' Exhibit 1 was received into evidence)

(Defendants' Exhibits 17, 24 and 26 were received into evidence)

JUDGE TONAKI: Okay. And are we ready to proceed?

MS. STEED: Your Honor, we have a couple other last minute stipulations. I apologize for the tardiness.

JUDGE TONAKI: Stipulations?

MS. STEED: Yes.

JUDGE TONAKI: Okay.

MS. STEED: The parties have agreed to admit Defendants' Exhibits D1 through D10 into evidence as well.

JUDGE TONAKI: Let's see. D1 through 10?

MS. STEED: Yes.

JUDGE TONAKI: Defendants' Exhibits 1 through 10 will be received in evidence.

(Defendants' Exhibits 1 through 10 were received into evidence)

MS. STEED: Okay. And additionally -- and we do apologize, there was a last-minute amended witness list. We have spoken between the parties and agreed that Patrick Hart will also be appearing as a witness for the Defendants. And I have a courtesy copy of the filing if your Honor would like.

JUDGE TONAKI: Patrick Hart?

MS. STEED: Yes.

JUDGE TONAKI: Okay. Is that correct, Mr. Vandeveer?

MR. VANDEVEER: Yes, your Honor.

JUDGE TONAKI: Okay. So Patrick Hart will be -- there's seven witnesses on the list, right?

MS. STEED: Yes, your Honor, although because we have stipulated to Exhibits D1 through 10, we will no longer be calling Ms. Hageman, who is listed as the first witness.

JUDGE TONAKI: Okay. Okay. Anything else?

MS. STEED: One further thing, your Honor. I

believe we have agreed to sequester witnesses.

JUDGE TONAKI: Well, you mean the witness exclusionary rule?

MS. STEED: Yes.

JUDGE TONAKI: Yes. The Court will invoke the witness exclusionary rule, so if there are any witnesses who are currently in the courtroom, you must remain outside until you're -- you're called to testify. And any witnesses who do testify are not to discuss their testimony with other witnesses at the conclusion of their testimony. And I will impose on counsel the obligation to enforce the witness exclusionary rule, okay?

MR. VANDEVEER: Understood, your Honor.

MS. STEED: Thank you, your Honor.

JUDGE TONAKI: Yes.

Okay. Anything else?

MS. STEED: I guess just if I may tell the witnesses to --

JUDGE TONAKI: Pardon me?

MS. STEED: If I may instruct my witnesses that they need to leave the courtroom now?

JUDGE TONAKI: Oh, so that --

MS. STEED: Okay.

JUDGE TONAKI: Well, before you do that --

well, yeah, maybe they better leave now, yeah.

MS. STEED: Yeah.

JUDGE TONAKI: Okay. Well, was that Ms. Lia? Is -- she's not a party.

MR. VANDEVEER: She's the plaintiff -- one of the plaintiffs, your Honor, yes.

JUDGE TONAKI: Because she's a party, she can remain.

MR. VANDEVEER: She can remain?

JUDGE TONAKI: Yeah.

MR. VANDEVEER: Okay. I'll let her know.

JUDGE TONAKI: Yeah, I think she --

MR. VANDEVEER: She's okay?

JUDGE TONAKI: Yeah.

MR. VANDEVEER: Thank you, Judge.

JUDGE TONAKI: Okay. Are there any other preliminary matters?

MR. VANDEVEER: No, your Honor.

MS. STEED: No, your Honor.

JUDGE TONAKI: Okay. The Court has reviewed the application for petition for preliminary injunction as well as the memoranda in opposition, DLNR, also the Intervenor as well as there was an amicus brief that was submitted by Bird Justice, so I think we can proceed straight to the evidence.

Are the parties ready?

MR. VANDEVEER: Your Honor, if we may, just a few opening remarks?

JUDGE TONAKI: Well, as I said, I reviewed the motion -- the motions and the memoranda so I don't think -- I understand this parties' position. I will allow for closing --

MR. VANDEVEER: Okay.

JUDGE TONAKI: -- arguments at the end of the proceeding, but I think we can just proceed straight into the evidence.

MR. VANDEVEER: Okay. Thank you, your Honor. Plaintiffs are prepared to proceed.

JUDGE TONAKI: Okay.

MR. VANDEVEER: And at this time we'll call our first witness, Dr. Lorrin W. Pang.

Can you go get him?

UNIDENTIFIED SPEAKER: Yes.

DR. PANG: Where do I sit?

MR. VANDEVEER: Next to the judge.

THE CLERK: Do you solemnly swear or affirm that the testimony you are now about to give will be the truth, the whole truth and nothing but the truth?

DR. PANG: Yes.

JUDGE TONAKI: Also, before we start, we were

scheduled to have a court reporter today, but as you know, there are a lot of trials going on this week and we were notified this morning there will be no court reporter, so if I can ensure that you folks speak clearly into the microphone -- and also the witnesses speak clearly into the microphone so we get -- we're recording everything, and any transcript that's going to be made later will have to come off the recording, so it's essential that the parties speak clearly into the microphone.

MR. VANDEVEER: Understood, your Honor.

JUDGE TONAKI: Okay. Thank you. Please proceed.

LORRIN W. PANG, M.D.,

having first been duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. VANDEVEER:

Q Good morning, Dr. Pang.

A Good morning.

Q Can you please tell us about your education?

A I'm born and raised in Honolulu. I finished at Punahou School and then I went to Princeton -- Princeton University from 1971 to '75. I graduated with

honors in Chemistry, but parallel to that, I took four years -- or equivalent four years of mathematics and physics.

Then I went to medical school from '75 to '79 at Tulane, and at that time during medical school, I also got a Master's in Public Health in Tropical Medicine. My goal was to practice topical medicine.

A year after medical school, I deferred for one year to see tropical medicine myself, and I was an exchange student for Tulane. I went to learn the pathology of tropical diseases in Northeast Brazil, and they sent an exchange student to learn immunology at Tulane.

I had taken, by then, the scholarship for the military, specifically that I would be assigned overseas to -- sorry -- study tropical diseases. So after doing my internship at Letterman Army Hospital, because you need that -- I already had the Master's of Public Health -- they assigned me to Bangkok, Thailand for the next, gosh, five years, and we were working on malaria treatment, pest -- pesticide.

(Audio from 09:14 to 09:19 not transcribed)

We went for a sabbatical in Brazil to just visit them again. It was ten years ago. I was a professor of medicine at the Federal University, and

that's where I first saw Wolbachia. They were planning for a sweep to bring Wolbachia to spread out through all of the dengue areas, and Wolbachia, in that mosquito against dengue, makes the mosquito less apt, lower risk, less carriage of dengue. I went over their numbers. We didn't publish anything. We just came to an understanding that move ahead, try to sweep and try to control dengue.

And then I want continued on and now this issue came up and I reentered again.

MR. FRANKEL: Objection, your Honor. Move to strike. Non-responsive and well beyond the question.

MR. VANDEVEER: Your Honor, he was answering a question about what he has done since completing his degree.

JUDGE TONAKI: The objection needs to come in before he answers. He's been answering all the -- he's been testifying for a few minutes now.

So Mr. Vandeveer, I will ask you to please ask questions, rather than have narrative answers.

MR. VANDEVEER: Yes, your Honor.

MS. STEED: Your Honor, the State respectfully moves to strike the testimony regarding Wolbachia because it was non-responsive to the question asked.

JUDGE TONAKI: Overruled.

Okay. Now, I thought you folks were going to designate an attorney between the two of you that would handle a certain witness because --

MS. STEED: Oh --

JUDGE TONAKI: -- that was my understanding, you were going to coordinate so we had one attorney between the DLNR and the Intervenor handling the witness.

MR. FRANKEL: Our understanding is that's for the direct, your Honor, not for the cross.

JUDGE TONAKI: Okay. Well, I would prefer one attorney making the objections and also one attorney handling the cross.

MR. FRANKEL: Can you then give us a couple minutes to consult about that? I think it's going to be challenging for us to do that. I mean, we're certainly operating under the assumption for the direct witnesses; we weren't aware for the cross.

JUDGE TONAKI: Okay. Well, yeah, why don't you folks take a few minutes and work that out? Because that was my understanding after the conference the other day.

MS. STEED: Apologies, your Honor. Our understanding was that for direct examination, we would not both be directly examining as that would be a very

long time for us to be able to make direct examination; however, our understanding is that we are still separate parties and so we would both be doing cross-examination.

JUDGE TONAKI: Okay. Okay. Well --

MS. STEED: And we have different -- apologies, your Honor. We have different interests as well. I mean, the State's interests, you know, are clearly distinct from that of American Bird Conservancy.

JUDGE TONAKI: Okay. I'm going to caution you not to go over the same things in cross as between the two of you.

MS. STEED: Understood, your Honor. We will make sure that we do not overlap.

JUDGE TONAKI: I sustained the objection, but that's already been covered by the other party.

MS. STEED: Understood. It won't happen again, your Honor.

MR. VANDEVEER: Respectfully, your Honor, Plaintiffs' understanding was the same as the Court of the hearing this week and also in the interest of efficiency --

JUDGE TONAKI: Right.

MR. VANDEVEER: -- I think it makes sense for both direct and cross.

JUDGE TONAKI: Okay. Proceed, Mr. Vandeveer.

MR. VANDEVEER: Thank you, your Honor.

BY MR. VANDEVEER:

Q Dr. Pang, are you currently employed in the scientific field?

A Yes. Well, in the Department of Health, we do publish -- I've recently published maybe eight articles in the last three years.

Q What is your current position?

A I'm the District Health Officer for Maui County under the Hawaii Department of Health.

Q And are you speaking today in that capacity?

A No. I was asked to speak as a private citizen. The former Director of Health allowed me to speak for the Department of Health about Wolbachia, but the new director asked me to speak as a private citizen.

Q You -- I'm sorry. How long have you worked as the Maui County District Health Officer?

A Since the year 2000.

Q Do you specialize in any areas?

A Epidemiology and statistics, and recently in the last two or three years mathematical modeling, Covid and now rat lung disease.

Q Do you specialize in the areas of tropical diseases?

A Yes, I do. During the dengue outbreak, we

were consulted internationally. People trying to tell us how to control the vector. CDC was here, but we did it.

Q Do you specialize in the area of disease vectors?

A Yes, for -- you mean you want examples? Not only are we --

Q I'll ask the question, Dr. Pang.

Can you describe what a disease vector is?

A A disease vector is what carries the germ to the target host. Now, you might not like the host, the rat, or you might like the host, humans, but it is the way that the germ gets to the host. The cycle is completed when the host puts out more germ and the vector takes it back to them. Round and round you go.

Q How long has epidemiology, statistics, tropical diseases and disease vectors been your area of expertise?

A It was my area ever since I finished the Master's in Public Health in 1979. That was -- you weren't allowed a specialty, so I chose tropical diseases, but the Walter Reed hired me as the epidemiology statistician in the first assignment to Bangkok, and ever since then, that's my area.

Q What type of training, if any, have you

received to prepare you to work in this area of expertise?

A First of all, there's core courses at Public Health. The Public Health is two years. There's core courses. And then after that, you kind of self-educate, and if you're good or have questions, you can publish on it, so I published on these different areas -- whatever disease, we always publish on an epidemiological aspect, but only recently have I taken on modeling.

Q Have you worked specifically with mosquito-borne illnesses?

A Oh, yes, mostly malaria, and then there are -- you should know some things like mosquitoes, like sand flies, they're kind of like mosquitoes, they spread a whole another set of diseases, and now my students consult for Doctors Without Borders. They invited me back to cover that area also.

Q Can you explain what mathematical modeling is?

A Mathematical modeling, there's generally two areas. If you give me data from the field, I can fit the data to the best math I can. Sometimes it fits nice to equations, simple things. Sometimes it doesn't.

The other approach is to come out of an equation kind of simple and then go do your field studies to see if it fits.

So it can be both ways, fitting data to -- I'm sorry. Fitting the equation to existing data as best you can and sometimes coming up with the equation and then go make the studies to see if it fits. Either way.

Q Have you mitigated any public health outbreaks of mosquito-borne illnesses?

A Well, yeah, in dengue. As soon as I came to Maui in the year 2000, we had a big dengue outbreak and we shut that down in six months. A lot of people said, "You'll never do it," and they're not shamed to say they said that, but we did it, and so hence the presentation at Johns Hopkins.

Q And how did you do it?

A Well, CDC was here and they were trying to control the vector because we have no vaccine and there was no treatment, and we had trouble diagnosing who was who, disease or carrier.

So then they said, "You gotta use the rules here, and a vector will go maybe a couple hundred yards, so spray a couple hundred yards."

The outbreak was in Hana. I took them to Hana. There's no couple hundred yards. The jungle is 25 yards, so we struck a deal. I would do 25 yards three times when they're diagnosed or when they're symptomatic. When they're diagnosed, two weeks later

and one month later. They said, "Okay. That's the best we can do," and that worked. So we weren't doing 200 yards one time, but 25 yards three times. They said, "As long as you monitor your cases, you know, make sure things are good," and then we did eradicate it in six months.

Oh, sorry. By the way, we were accused by the rest of the world, "You had the easy vector."

MS. STEED: Objection.

JUDGE TONAKI: Well --

MS. STEED: Objection. Hearsay.

JUDGE TONAKI: Overruled.

THE WITNESS: We were accused that we had the easy vector for dengue, Aedes albopictus for a vector, rather than Aedes aegypti, which the rest of the world had.

The CDC took samples of the egg of Aedes albopictus and sent it to the Institute Pasteur, and said, "Whatever you have, Dr. Pang, has such a high carriage rate of the virus, it's higher than Aedes aegypti."

The point is that in the 150 years that we have had this vector on Maui, it has speciated to be a very powerful carrier of dengue. So I wasn't trying to say, "Well, CDC we didn't have the easy one," and then

they sent scientists here from Japan to say, "Whoa, what did you do?" Because they have the same vector too.

And I warned them that their speciation was a strain of Aedes albopictus might be different than ours. 150 years is a long time.

BY MR. VANDEVEER:

Q I would ask you to -- if you can, Dr. Pang, just pull back from the mic a little bit and speak louder, if it's okay. I'm having trouble understanding some of what you're saying when you're really close to the mic.

A Okay.

Q Dr. Pang, have you written any articles related to mosquito-borne illnesses?

MR. FRANKEL: Objection. Vague.

JUDGE TONAKI: Overruled.

THE WITNESS: We've written so many articles about malaria, the treatment, and always in there in the background is that if we can't treat it or resistance is developing, shall we address the mosques?

Now, the mosquitoes developed resistance to DDT, and they were banning DDT because of development of resistance worldwide, and so we had a meeting -- international meeting that everybody stopped using DDT except for malaria for health reasons. But for

agriculture, everything stops. And now the world says not even for malaria, human malaria, human malaria, should you use DDT.

I sided with the Haitians, who were poor, and they said, "We need DDT." So we took the position for the vector for malaria. They can use DDT but try not to abuse it.

MR. FRANKEL: Objection, your Honor. Non-responsive. Move to strike.

JUDGE TONAKI: Sustained. The question was, I think, on publication.

MR. VANDEVEER: The question -- yes, your Honor. Thank you.

BY MR. VANDEVEER:

Q The question was have you written any articles related to mosquito-borne illnesses?

A Yes, maybe 40 or 50.

Q I'm sorry?

A Yes.

Q I didn't hear you.

A Yes, maybe about 40 or 50.

Q 40 or 50.

Were those articles published?

A Yes. I only refer to published peer reviewed.

Q What was the date of your last publication?

A Of -- of mosquito-borne illnesses?

Q Article, yes.

A Maybe 2013 or so, dengue and --

Q And I believe you mentioned one of the subjects of those articles.

Can you recall any subject matter from the other articles, the 40 or 50 other, briefly?

A Oh, they always cover the background of how do we stand with prevention, controlling the vector. There were bed nets, impregnated bed nets with pyrethroids. There was insecticide.

But it always ends up as, what do we get down the line? So ours was rapid diagnosis, early treatment, and then if that fails, treatment of severe malaria.

I think the last article came out of Bangladesh. They had trouble with rapid diagnosis.

MR. VANDEVEER: Your Honor, at this time Plaintiffs would move to certify Dr. Pang as an expert witness.

JUDGE TONAKI: In what field?

MR. VANDEVEER: In the field of tropical diseases and disease vectors, and able to speak on the matters at issue in this case.

JUDGE TONAKI: Voir dire?

MS. STEED: Yes, your Honor, thank you.

VOIR DIRE EXAMINATION

BY MS. STEED:

Q Good morning, Dr. Pang.

A Good morning.

Q You previously testified that you have an undergraduate degree in chemistry; is that correct?

A Yes, with honors.

Q And you do not have an undergrad degree in entomology?

A Princeton did not give an undergraduate degree in entomology. Not in those days.

Q So is that a no?

A I don't have what was not offered.

Q Dr. Pang, is it correct that you do not have a degree in ornithology?

A Ornithology. Can you please define for everybody here what exactly you mean? Is that birds?

Q Yes, it's birds.

A The undergraduate degree at Princeton was in biology. If you chose to specialize in ornithology, you got a degree in biology.

MS. STEED: Your Honor, please instruct the witness to answer the question.

JUDGE TONAKI: Just answer the question. Do you have a degree in ornithology?

THE WITNESS: No.

BY MS. STEED:

Q When you say that you studied disease vectors, have those been for human disease?

A Mostly yes, but they do overlap with agriculture now.

Q And so when you study dengue, this is dengue that affects humans?

A Yes.

Q Is that correct?

And when you study malaria, this is malaria that affects humans; is that correct?

A Yes.

Q So you have never studied malaria in other species; is that correct?

A Studied or published?

Q Well, let's start with studied.

A I have studied extensively malaria in other species.

Q Have you studied it with an academic institution?

A World Health Organization, yes.

Q In which species were those?

A The species of mosques, right, that travels. They say trying to treat mosquitoes --

Q Mr. Pang, I think you misunderstand my question.

I'm asking if you studied malaria other than human malaria.

A Yes.

Q And in which species?

A Plasmodia gallinacei, Plasmodia berghei, the mouse -- the rat. Plasmodium gallinaceum is chicken malaria. Plasmodia -- those two because those were the animal models to test our drugs.

Q And when you studied mosquitoes in Brazil, is it correct that you studied a specific species of mosquito?

A Well, we studied the mosquito that transmits dengue in Brazil, correct, Aedes aegypti.

Q And when you studied mosquitoes that carry malaria, did you study the anopheles mosquito?

A I'm sorry. The what?

Q The anopheles mosquito?

A Can you repeat that?

Q When you studied mosquitoes that -- mosquitoes that are vectors for human malaria, did you study the anopheles mosquito?

A I never heard that word before. Is that another --

Q What type --

A -- species?

Q -- of mosquito did you study?

A Sorry?

Q What type of mosquito did you study when you studied human malaria?

A I studied the mosquitoes --

Q Dr. Pang --

A Oh, I'm sorry. I know what you mean. Anopheles?

Q Yes.

A Oh, gosh. It's anopheles mosquitoes. I studied many anopheles mosquitoes, stephensi, peridomincelari (phonetic) in India, many other mosquitoes, the forest vectors, the gambiae in Africa.

Q Okay. So --

A I mean, just all of them.

Q -- if you studied human malaria, the anopheles mosquito is specifically the mosquito that you studied?

A Yes, yes. On -- yeah, except when we looked at animal malaria for the animal models. I can't recall what vector transmitted it what -- anopheles transmitted it to chicken. We studied chicken mouse -- we studied mouse --

Q Dr. Pang, is it -- is it fair to say then that

for malaria you have studied the anopheles mosquito species?

A Yes.

Q And for dengue, you have studied the Aedes aegypti mosquito?

A Yes.

Q And the Aedes albopictus mosquito?

A Yes.

Q You have not studied the culex quinquefasciacitus mosquito?

A Not until my recent publications.

Q Your recent publications in 2013?

A I'm sorry. I take that back. I was confusing it with rat lung, the rat lung publications. No, I have not published on culex.

Q And it's fair to say that rat lung was -- strike that.

The disease vector for rat lung disease is slugs; is that correct?

A Correct.

Q So it's fair to say that you have not studied the culex quinquefasciacitus mosquito?

A Culex quinquefasciacitus? Not for malaria. It carries other diseases, yeah. Culex quinquefasciacitus. We always were afraid that it would

bring West Nile into Hawaii. That's a culex we have. Oh, we actually studied it extensively out of --

Q Dr. Pang --

A -- (inaudible) not with pesticides.

Q -- thank you. You've answered the question.

Is it -- is it correct that you have not published any papers on Wolbachia?

A Wolbachia, that's correct.

Q And you have not studied the incompatible insect technique?

A That's correct.

Q And you have not --

A Wait. Wait. I studied or published? I studied it but I haven't published.

Q Have you studied it with a research institution?

A Oh, I think I've study it. I'm trying to think with a research institution. The Department of Health. The former director covered me and said, "You speak for the Department of Health." They do research.

Q You did not publish on dengue?

A Correct.

Q Okay. And you have not published any papers on horizontal transmission?

A Of?

Q On --

A What disease?

Q On horizontal transmission of Wolbachia.

A Oh, correct, I have not published on that. I gave presentations.

Q But not published publications?

A Correct.

Q And you have not published on avian malaria?

A Avian malaria? I haven't published on it, correct.

Q And you have not studied avian malaria on endemic Hawaiian honeycreepers?

A Studied or published?

Q Published.

A I haven't published, no.

Q And it's correct that you are not currently authorized to speak about Wolbachia by the Department of Health?

A Correct, by the new director.

Q By the Department of Health.

A The new director of the Department of Health, correct.

Q Which is the Department of Health, correct?

A Correct.

Q Thank you.

And isn't it also correct that you made statements in support of using Ivermectin to combat the Covid-19 virus?

A I made statements about Ivermectin, correct.

Q And is it correct that the Department of Health reprimanded you for making those statements?

A Absolutely not.

Q You were not reprimanded for making statements about Ivermectin by the Department of Health?

A Not by the Department of Health and not by the Governor, and I'm offend by that comment, if it goes formally. I cleared my name by the Board of --

Q Dr. Pang --

A -- Medical Examiners.

Q -- I have not asked you about that.

A Then try not to bring it up.

MS. STEED: Your Honor, the State respectfully objects to Dr. Pang being qualified as a witness today -- an expert witness today on the grounds that he has not studied the transmission of Wolbachia, he has not studied avian malaria. His expertise, although may be broad in the medical field, it is not related to insect -- incompatible insect technique, which is the subject of the environmental assessment.

MR. FRANKEL: Your Honor?

JUDGE TONAKI: Mr. Frankel, any voir dire?

MR. FRANKEL: Just very briefly, your Honor.

VOIR DIRE EXAMINATION

BY MR. FRANKEL:

Q Dr. Pang, you received formal training as a doctor, correct?

A Correct.

Q You're a medical doctor?

A Correct.

Q Not a veterinarian?

A That's correct.

Q You did not major in biology in college?

A I did take a -- correct.

Q You didn't study Hawaiian birds in college?

A No, I did not.

Q You did not study avian disease transmission in college?

A Study or published?

Q You did not study avian disease transmission in college?

A In college, correct.

Q You've never conducted any experiments assessing the transmission of avian diseases?

A That's not true. I have.

Q Of avian diseases? Okay.

A That's not true. I have extensively studied --

Q I didn't say studied.

A -- diseases.

Q You haven't conducted any experiments assessing the transmission of avian diseases?

A I have.

Q You did not perform any experiments with horizontal transmission in college?

A I'm not sure we had that term back then, but I'm not a biology major.

Q Okay. And you -- you did not perform experiments with Wolbachia in college?

A Correct.

MR. FRANKEL: Your Honor, American Bird Conservancy recognizes that Dr. Pang is an expert in infectious human diseases. He's an expert in mosquito-borne human illnesses. He can testify as to the vector of human diseases, but the qualifications offered by the Plaintiff are overly broad, particularly when they say in all matters in this trial. The scope of his expertise is narrow.

Thank you.

JUDGE TONAKI: Mr. Vandeveer --

MS. STEED: Your Honor, may I make one more remark?

JUDGE TONAKI: Yes.

MS. STEED: Additionally when asked about the types of mosquitoes and when asked specifically about the mosquito that is used in this project, the subject of this lawsuit, Dr. Pang got confused.

JUDGE TONAKI: Okay. Mr. Vandeveer, my understanding is you're offering Dr. Pang as an expert in two areas, tropical diseases and disease vectors?

MR. VANDEVEER: Yes, your Honor.

JUDGE TONAKI: Okay.

MR. VANDEVEER: As it -- as it applies to the review and evaluation of the studies in this proposed project relating to Wolbachia.

So, your Honor, if I may, the human risk, as your Honor is aware, is one of the risks that Plaintiffs have identified in this project as well as --

MS. STEED: Objection, your Honor. That's beyond the scope of voir dire.

JUDGE TONAKI: Well, he was making his argument as to --

MS. STEED: All right.

JUDGE TONAKI: -- Dr. Pang's --

MS. STEED: Withdrawn.

JUDGE TONAKI: Okay.

MR. VANDEVEER: As well as the entire web of life. Dr. Pang's experience since his education, which Dr. Pang, understand, was over 40 years ago, I think lends heavy credence to not only his experience in disease vectors and tropical disease, but he's also taken part in numerous studies, as he testified.

I believe the concerns being expressed by Defendants go to the weight of his testimony, your Honor, specialization, and not as to whether he's qualified to opine as to the studies in the proposed project to help you, as the trier of fact.

And so I would ask that your Honor allow Dr. Pang to testify as to any review and evaluation regarding the proposed project.

JUDGE TONAKI: Okay. The Court will qualify Dr. Pang in the limited area for purpose of this disease of disease vector, because it sounds as though Dr. Pang has done quite a bit of work in the area of vector control as it relates to mosquitoes, which is the issue in this case.

So the Court will not qualify him as an expert of tropical disease because his work has been done in the area of disease -- human diseases, and we're dealing obviously here with avian disease, so with --

MR. VANDEVEER: I'm sorry, your Honor, to --

JUDGE TONAKI: Yes.

MR. VANDEVEER: If I may? With respect to Dr. Pang's knowledge in tropical diseases, the risks that have been identified in this project go to the very heart of what his specialization is, and that is the risk of this escaping the project and impacting humans.

JUDGE TONAKI: So -- so the Court will allow Dr. Pang to testify as to the vector, the mosquitoes, and how this might impact the spread of other diseases, if that's his opinion, but will not allow him to go into length as to the various tropical diseases and malaria and whatever human diseases that -- I don't think those diseases are at issue here in this case.

MR. VANDEVEER: Thank you, your Honor.

MS. STEED: Your Honor?

MR. VANDEVEER: Ms. Steed?

MS. STEED: Respectfully, we request that in terms of his qualification as a vector disease expert, it would be narrowly construed to only vectors of human -- carrying human diseases because that is his specialty.

JUDGE TONAKI: Well, yeah, I don't -- I don't -- Dr. Pang is not going to render any opinion as to the effect of avian malaria on birds, right? That's not

going to be his -- his testimony today?

MR. VANDEVEER: His testimony today, your Honor, will be as to the effect of the Wolbachia project, the IIT technique, what is being proposed currently --

JUDGE TONAKI: Yeah, the mosquitoes.

MR. VANDEVEER: Right, and the effects -- the significant effects it can have on the environment including humans.

JUDGE TONAKI: Okay.

MS. STEED: Your Honor?

JUDGE TONAKI: You're limited to that.

MS. STEED: I apologize, your Honor, but respectfully, as to humans, we accept he can qualify as an expert for disease vector relating to Wolbachia transfer, but as to the rest of the environment, he's given no background that he has any degrees in ecology, for example, that he can speak to the broader effects of Wolbachia on the natural environment, only as to humans.

JUDGE TONAKI: No, I'm not qualifying him as to rendering opinions as to the environment in general; it's just the vector part of it, the mosquitoes.

MS. STEED: Thank you, your Honor.

JUDGE TONAKI: That's the best I can narrow it.

MR. VANDEVEER: Thank you, your Honor.

JUDGE TONAKI: Okay. Go ahead.

DIRECT EXAMINATION (Continued)

BY MR. VANDEVEER:

Q Dr. Pang, is there any current literature related to your expert opinion regarding the risks of tropical disease transmission in this case?

MR. FRANKEL: Objection. It goes beyond the scope of his field.

JUDGE TONAKI: Overruled.

THE WITNESS: Yeah, there is a publication on this project that should our mosquito, the one that could transmit West Nile Virus, should it pick up Wolbachia by mistake through this project, that mosquito culex could be up-regulated, increased risk of transmitting West Nile Virus. That's a little counterintuitive. Most of the time the mosquitoes, when they get Wolbachia, the diseases they transmit, you know, dengue and things like that, go down, but for West Nile Virus, a human disease, we're a little worried that our mosquito with culex, which transmit that, might transmit more if it gets Wolbachia. There's a publication on that.

BY MR. VANDEVEER:

Q Can you summarize the literature you relied upon?

A It was a cross reference of your -- one of your exhibits. It -- sorry. It's the exhibit itself 9, 10, 11, 12, 13 -- I think it's Exhibit 13, West Nile Virus that sometimes Wolbachia will up-modify it, and they got in a discussion whether that Wolbachia was acquired in the lab or naturally transmitted. That has yet to be defined how the mosquito culex got Wolbachia to up-regulate West Nile Virus.

Q Okay. So let me just back up just a bit, Dr. Pang. Have you had the opportunity to review the documents related to this case?

A Yes. Well, the ones you gave me.

Q What documents have you reviewed?

A P 9, 10, 11, 12, 13, 14.

Q Sorry. In -- not speaking as a the exhibit numbers, let me just ask you specifically: Have you reviewed the environmental assessment?

A Oh, yeah, yeah.

Q Have you reviewed any emergency exemptions?

A No. I mean, I glossed over them. I focused on the exhibits, but -- I mean, the scientific articles.

Q How did you choose what to review?

A Actually, you passed them to me because I brought them to you as articles that made me concerned that the safety of this project has not been fully vetted, reviewed.

Q Have you reviewed any public information that's been provided by either the DLNR or --

A I've seen it. I've seen it. It's in the media and all. It's on the radio, yes.

Q Can you describe this project as you understand it?

A This project is to release a novel Wolbachia through male mosquitoes, because when the male carries that novel Wolbachia, all matings with the wild females will be sterile. In other words, it's a form of sterilization, but instead of irradiating the male or irradiating the female, you just introduce Wolbachia to the male.

If it works as planned, it's wonderful, but I wonder if it's as effective as they think it will be, you know, if they're not overpromising and the side effects. If things go wrong and this Wolbachia somehow gets to the female mosquito, the wild female, then we have what the Brazilians call a sweep.

MS. STEED: Objection. Beyond the scope of the question.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q Thank you, Dr. Pang. If you could just limit your answers to my questions?

A Yeah.

Q So what concerns do you have with this project?

A That they're overpromising the efficacy and that there's side effects of horizontal transfer.

MR. FRANKEL: Objection, your Honor. Move to strike. Beyond the scope of his field.

JUDGE TONAKI: Overruled.

BY MR. VANDEVEER:

Q And when you say horizontal transmission, do you consider that a significant impact on the environment?

MR. FRANKEL: Objection, your Honor. Again goes beyond the scope of his field.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q Did you find any of the documents that you said that you reviewed, the environmental assessment, any public documents sufficiently explain the risks of this project?

MR. FRANKEL: Objection. It goes -- it's far

too broad, beyond the scope of his field.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q In the documents that you reviewed, did you find any explanation as to what horizontal transmission would occur?

MR. FRANKEL: Objection, your Honor. Goes beyond the scope of his --

JUDGE TONAKI: Overruled.

THE WITNESS: Sorry. Can you repeat the question? I was trying to listen to what he said.

BY MR. VANDEVEER:

Q Certainly. In the documents that you reviewed, did you find any explanation as to horizontal transmission as a result of this project?

A In the discussions, because I was asked to meet with the experts from their side, and they admitted horizontal transmission could occur, but it would occur on an evolutionary scale.

MR. FRANKEL: Objection. Non-responsive.

JUDGE TONAKI: Overruled.

MR. FRANKEL: Move to strike.

JUDGE TONAKI: Overruled.

BY MR. VANDEVEER:

Q Can you explain what horizontal transmission

is?

MR. FRANKEL: Objection, your Honor. This is -- horizontal transmission --

JUDGE TONAKI: Overruled.

MR. FRANKEL: Okay.

THE WITNESS: Horizontal transmission, the transmission of Wolbachia or any other germ can go vertically to the offspring and propagate that way, offspring to offspring, or it can go horizontally not to the offspring but to the -- let's say -- sexual partner or to your dog and spread out that way non-sexual, so there's vertical transmission and horizontal.

Horizontal just means going sideways. Once it goes, it has to get into the germ cells to then propagate, and that was the contention with their experts, that that would take a long time, evolutionary scale, which I found not to be true.

BY MR. VANDEVEER:

Q I'm sorry. You said -- repeat the last part. You found it not to be true?

A I asked them what evolutionary scale meant and they just rolled their eyes and said, "You know, long time." My public -- articles and publications --

MS. STEED: Objection. Hearsay and also goes beyond --

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q Can you explain non-sexual horizontal transmission of Wolbachia bacteria?

A The best explanation I can give is a human analogy which is -- okay? So there's the diseases that when a couple have sex, it might go to the baby -- that's vertical -- or it might go to the partner, regardless of what happens to the baby. So in the act of sex, it could go horizontally or to the baby or both.

Now, in the world of Wolbachia, there are exhibits that say that it could go both, either way.

Q And did you base this opinion on any peer reviewed articles?

A Yes, there was a peer reviewed article and there's cross reference as one of your exhibits. I think it's the one by Ahmad, Exhibit 1, 2, 3, 4 -- 14. He gives a cross reference where they say that in aphids, it may occur going horizontally in sex as well as vertically. The issue has always been. Once it goes horizontally into your general body cells, how quickly does it pass to your germ cells to start the cycle?

Q So that goes to my next question, Dr. Pang. If it gets in female mosquitoes, what are the risks you're concerned about?

A My risk is that it will go quickly to the germ cells and start to propagate, and then we'll have a sweep of that Wolbachia into our mosquitoes.

Q Can you describe what sweep means?

A Sweep means that the Wolbachia takes over all your mosquitoes, a high percentage. Now, it might be a lower number but it's a high percentage, so it dominates your mosquitoes.

That's what they use for dengue control. You want them to get Wolbachia because then they won't -- the mosquitoes won't get dengue so badly.

Q And why is it bad in the scenario you described? Why would this sweep be bad, in your opinion?

A I think -- there's from both sides. I think I'd agree on this --

MS. STEED: Objection. Calls for improper expert opinion.

JUDGE TONAKI: Overruled.

THE WITNESS: I think we agree with this because there was discussion amongst your own side when I went to -- you invited me to the counsel of experts.

BY MR. VANDEVEER:

Q Sorry, Dr. Pang, if you can just address my question --

A Okay.

Q -- and explain? Thank you.

A One group thought no big deal if it gets out and sweeps. The other group thought it's a big deal because we did not know what Wolbachia will do in this mosquito population against both the birds and against other targets, like the bees.

MS. STEED: Objection, your Honor. Dr. Pang was certified to talk about the effect on humans, not other species.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q Is there a possibility, Dr. Pang, that this sweep that you described could impact humans?

A Indirectly if it impacts -- if it impacts the insects that we like, like bees, but not directly to humans.

MS. STEED: Objection. It goes beyond the scope of expert opinion. He can testify as to what impact Wolbachia would have on a human, but as to what effect it has on bee ecology and, therefore, a --

JUDGE TONAKI: Objection.

MS. STEED: Thank you.

JUDGE TONAKI: Just as to humans.

BY MR. VANDEVEER:

Q Dr. Pang, could you please describe any concerns you have regarding non-sexual horizontal transmission in Wolbachia? I'm sorry. Strike that question.

Can you explain what non-sexual horizontal transmission is?

A Non-sexual horizontal transmission was in some of the exhibits. One is that when animals feed that have Wolbachia, they kind of regurgitate or defecate, and when there's common feeding areas, they can pick it up, the feces. This was shown in the ant.

Now, I've assumed that -- what I know mosquitoes feed together for sugar meals --

MS. STEED: Objection. Outside the scope of expert opinion on assuming how -- telling us how mosquitoes feed.

JUDGE TONAKI: Sustained.

MR. VANDEVEER: Your Honor, he's explaining a disease vector's behavior. I was under the impression that was allowed as to ants and other animals.

Understood.

BY MR. VANDEVEER:

Q Okay. Dr. Pang, do you have any other concerns regarding non-sexual Wolbachia transmission?

A Yes.

Q What are they?

A It --

Q You can continue until he makes an objection.

MR. FRANKEL: Objection, your Honor. Going beyond the scope.

JUDGE TONAKI: Overruled.

THE WITNESS: Common feeding sites and serial predation.

BY MR. VANDEVEER:

Q And can you explain that?

A Common feeding sites is when things with Wolbachia feed at areas where things don't have Wolbachia. It could be interspecies or intraspecies.

MS. STEED: Your Honor, I move to strike that testimony on the basis that -- as the previous objection was just sustained in terms of he does not have expertise about how other species feed.

JUDGE TONAKI: Sustained.

MS. STEED: Thank you, your Honor.

BY MR. VANDEVEER:

Q You can continue with the other concerns you have besides what other species --

A The other concern was serial predation. It's published. It's one of the exhibits that when a

predator insect --

MR. FRANKEL: Objection, your Honor. Going beyond -- again he's talking about ecology of other species.

JUDGE TONAKI: Overruled.

THE WITNESS: That when a predator bites a Wolbachia prey, the infection will go to its mouth parts for the next 48 to five -- 48 hours to five days. It will then infect other prey that it bites, and so it's going prey to prey through the dirty mouth parts of the predator. It's called the dirty needle scenario.

BY MR. VANDEVEER:

Q How are the two different types of horizontal transmission that you've identified, sexual and non-sexual, different from what you've seen explained in the final impact environmental assessment?

A They seem to be ignored because of the argument that if it does occur, it will take such a long time to manifest in the germ cells and carry on the cycle.

Q And you think that's not the case?

A Yes, by the articles that showed it.

Q And do you recall any of the articles that you rely upon?

A One is your exhibit. It's by Ahmad. And they

showed that when there was serial predation, not only did it infect -- now, this was a model of white fly fed on by wasp. In the white fly --

MS. STEED: Objection. This is as to white fly, not mosquitoes. Again it's relating to the ecology --

JUDGE TONAKI: Sustained.

MS. STEED: Thank you, your Honor.

BY MR. VANDEVEER:

Q Dr. Pang, is it possible that a Wolbachia sweep could cause increased virus transmission in humans?

A It's possible. West Nile Virus.

Q And can you explain how that would happen?

A We don't know. We don't know how diseases are up-regulated and down-regulated. All we know is how they might sweep.

Q Can you explain what up and down regulation is?

A It means that the -- all things being considered, a vector with Wolbachia has a whole lot more virus, not only in its body parts, but its saliva when it bites humans, so the chance of increasing transmission is greater, and sometimes it can show this in humans, that the Wolbacia virus might actually have

that. They haven't gone that far yet. They're just looking biologically.

Q And biologically speaking, does up and down-regulating affect other species?

MR. FRANKEL: Objection.

JUDGE TONAKI: Overruled.

THE WITNESS: Sorry. Does up and down regulation affect other species?

BY MR. VANDEVEER:

Q Yes.

A I imagine if -- if the mosquitoes -- I don't quite understand the question.

Q So if -- if up and down regulation, as you mentioned, is possible with the Wolbachia sweep, can up-regulate, as I understand your answer --

A Oh, okay.

Q Sorry.

A I know what you mean.

Q Okay.

A This was covered by one of the exhibits. When Wolbachia appeared in certain other species, not humans, other species, they worried about fecundity, fertility, they worried about survivability, and they worried about competitiveness against the wild strain. This is your exhibit, the Ahmad paper.

Q And would those -- and would those -- would the impacts from up and down regulation of a species, would that also potentially have a negative impact?

A Oh, yeah, especially if --

MS. STEED: Objection.

THE WITNESS: -- it up-regulates --

MS. STEED: Vague.

JUDGE TONAKI: Overruled.

BY MR. VANDEVEER:

Q Continue, if you would?

A If it up -- you know, if it up-regulates, it's more dangerous to a bad species, a disease vector, that's good from our point of view. If it up-regulates something we like -- I can't say bees but something useful, that's bad from our point of view. And it's not just vector. Don't forget, Wolbachia goes into a basic person --

MS. STEED: Objection.

THE WITNESS: -- or persons.

MS. STEED: This witness isn't certified to discuss vectors.

THE WITNESS: Well, disease --

JUDGE TONAKI: (inaudible)

BY MR. VANDEVEER:

Q So I'd like you to explain, if you would,

up-regulating and down-regulating again. I'm still not quite understanding exactly what that means, so if you could take it --

My question is starting with a sweep, which you've explained has occurred where the Wolbachia has gone into other wild populations, if you can just take us through the process of what up-regulating and down-regulating -- how that would happen and explain that more?

A Okay. When you sweep a population, you introduce Wolbachia to of all of a population, let's say Aedes aegypti, which carries dengue. I actually don't know how it affects the survivability of the mosquito, but that mosquito with Wolbachia carries less dengue so you've down-regulated dengue in that vector.

It would be nice if mosquitoes die off so -- but they didn't, but at least they carried less dengue, so you down-regulated dengue. The dengue has less risk of transmitting it to humans, but the worry something is we don't know about West Nile in our vector that we have here, culex, that you might up-regulate it.

Q And what are the risks associated with -- if it might be up-regulated?

A Well, you have more West Nile Virus, and, you know, Hawaii is pretty free of West Nile Virus for now.

We don't quite understand why.

Q Did the same happen for malaria?

A No, I think -- I think when it gets into human malaria -- human malaria, I don't think it up-regulates human malaria, but there's a prop -- it's been published in one of your articles that it might up-regulate avian malaria in your culex.

Q Did you see a discussion of this in your --

MS. STEED: Objection.

JUDGE TONAKI: What did --

MS. STEED: Permission to strike the last portion of that testimony on the basis that it asks -- asks the witness to guess.

JUDGE TONAKI: Overruled.

BY MR. VANDEVEER:

Q Did you see a discussion of this up-regulation possibility above regulation addressed in the final environmental assessment?

A It was quite marginalized because every time I talked about it, they said, "If it is horizontal transfer it will never take."

MS. STEED: Objection. Hearsay.

JUDGE TONAKI: Yeah, don't say what other people have said, just what your testimony is.

THE WITNESS: It's only by -- only by text

they mention it, but they did not want to talk further.
BY MR. VANDEVEER:
Q So in your opinion, it did not appear as an in-depth study?
A Correct.
Q It didn't address the concern?
A Right.
(inaudible whispering)
Q Can you explain, based on your scientific knowledge, about the increase of horizontal transmission when vertical transmission is suppressed?
A Yes. That was again one of your -- what do you call that? -- exhibits. I believe it's the Singapore consortium.
They did a field study and they saw -- they saw female mosquitoes with Wolbachia. They were doing an IIT project, just like you plan to do Upcountry for the birds. They're trying to suppress all the mosquitoes. And there was not supposed to be infected females with Wolbachia, let alone larva that they were transmitting, but they saw that.
They didn't call it horizontal transmission. They said maybe it's the lab. There was a lab error, okay? And it's kind of worrisome, but then it went away, and they said, "We think it went away because wild

mosquitoes came into the area and out-competed them."

And they were very worried that if you ever pulled off IIT and controlled all the wild mosquitoes, and this horizontal -- they thought it was lab release -- got out of control, that you'd have no control over those mosquitoes.

So they added to it irradiated -- all the mosquitoes so that if the wild mosquitoes were really controlled, like IID promised, you still wouldn't have this population expand because you added radiation to it.

They also said that if that got out of control, they'll bring in another Wolbachia to shut down that Wolbachia. This was the Singapore consortium, Exhibit -- the last Exhibit, 14.

MR. VANDEVEER: Your Honor, I'd like to introduce that exhibit for the Plaintiffs' recollection, if that's okay. I actually believe it's one of Defendants' exhibits. Just a moment.

MS. STEED: Your Honor, we'd like to clarify whether's he's introducing it into evidence or showing it to the witness?

MR. VANDEVEER: I'm showing it to the witness, your Honor.

THE WITNESS: Sorry. I didn't catch that.

What was -- what happened?
BY MR. VANDEVEER:
Q I'm going to show you an exhibit --
A Oh.
Q -- that you mentioned, Doctor.
A 14.
MR. VANDEVEER: Okay. Actually, this is the Plaintiffs' exhibit, your Honor. If I may, I'm just going to grab this cord here so I -- actually I'm not going to show it on the screen. Sorry. I'm going to show it to -- just a moment.
May I approach?
JUDGE TONAKI: What number is it?
MR. VANDEVEER: Plaintiffs' Exhibit 14.
THE WITNESS: Okay.
Sorry. Was I supposed to do something?
BY MR. VANDEVEER:
Q No, just making sure you've familiarized with that exhibit.
A Yes.
Q And can you explain what that exhibit is?
A This is the field trials done over the two-year time course in different phases in Singapore where they tried IIT suppression model on a different mosquito, Aedes aegypti, for the sake of dengue control,

not to compete with the sweep model, but to replace it in case people complained of too many mosquitoes with the sweep model. They would try to eradicate all mosquitoes altogether as an alternative approach.

Q And do you consider this, this article, this paper an authority?

A First of all, it's -- it's what they call preprint, so we publish in preprint. It's not formally reviewed by reviewers, but I do like preprint because you can read the comments. The comments come into this, so it is being recognized when you publish. These guys are quite good. I know this group. They publish very well on the Wolbachia topic.

Q When was this paper published, Doctor?

A Oh, boy, I can't remember. It's 2021, but the work was started in 2016. If I may give a summary of all their big chunk of studies? It gets a little confusing what study was done when. 2021, it was published, about four years of work.

Q And you provided a summary earlier. Are there any particular parts of that study that informed your opinion?

A The -- when you read all these different projects, first of all, the effect on IIT -- granted, it was with a different mosquito. It was pretty variable.

And at first it was low and then it was high. In some places it was high and very different.

If they just gave me a summary average, that's misleading, and they know that, so then they try to explain why some areas, they couldn't seem to control it. They said they didn't distribute it well, not to all the high-rise pockets of Singapore, but they also said there was drifting mosquitoes, all type coming in, deluding the effect of their -- of their IIT. But then they said, "We saw females carrying Wolbachia and larva with Wolbachia," and they thought it was escaped from the lab. Nonetheless, whatever it was, horizontal or escaped from the lab, they were very worried about these things taking off.

So then they said that somehow it controlled itself. These pockets disappeared, and they attributed that to wild type sweeping and out-competing it. Then they realized that if they ever did a good job of IIT and wiped out all the wild type, this little pocket would take off because there would be no competition, so then they added on irradiation sterility.

Q So Dr. Pang, just to take a step back, when you say IIT, can you explain what that is?

A Yeah, it's the same thing as -- I used to call CI, cytoplasmic incompatibility. IIT stands for Insect

Incompatibility Technique. So when you have one mosquito --

MS. STEED: Objection. I'm fine with him identifying what it stands for, but this is not a vector -- a resulted vector disease, so we do not believe that he is qualified as an expert to explain how IIT works.

JUDGE TONAKI: Overruled.

THE WITNESS: So when you -- when you have one of the mating pair, usually the male, male, carrying a novel Wolbachia or the female doesn't even have Wolbachia, the mating will be sterile. Now maybe not 100 percent, but the mating will be sterile, so that's -- they're incompatible. We don't fully know why, but that's it, the cytoplasm somehow is sterile and the offspring are sterile, but it might not be 100 percent.

BY MR. VANDEVEER:

Q And how does this -- what you just described, how does this relate to your concern about the project on Maui?

A It's a little bit roundabout because if you did wipe out all the wild mosquitoes, all the mosquitoes and you have left a remnant of horizontal transfer, there is nothing to compete with horizontal transfer.

It will then go with no competition.

There is a mathematical model for this in one of the exhibits, Exhibit 12, and they actually gave the formula, and I wonder if that formula is extensive enough, so I would like to discuss with them if they've considered all possibilities.

Q Okay. Doctor, you explained mathematical modeling. Can you explain --

JUDGE TONAKI: We have been going about an hour, so why don't we take a ten-minute break?

MR. VANDEVEER: Yes, your Honor.

JUDGE TONAKI: The Court will stand in recess.

THE BAILIFF: All rise. The Court is in recess.

(Recess was taken)

THE BAILIFF: All rise. This Court is reconvened. You may be seated.

JUDGE TONAKI: Okay. We're back on the record in Hawaii Unites versus DLNR.

Dr. Pang is still on the stand.

Mr. Vandeveer, you may continue.

MR. VANDEVEER: Thank you, your Honor. May I approach the witness --

JUDGE TONAKI: Yes.

MR. VANDEVEER: -- and give him this, the same

Exhibit P14?

JUDGE TONAKI: Yes.

BY MR. VANDEVEER:

Q So Dr. Pang, in this article that you've referenced, I believe you reference it shorthand as Singapore study.

What -- what year was it published?

A 2021.

Q And did they discuss sterility in this -- in this article?

A Well, the IIT project is a sterility project so -- and then they added on radiation to guard against escape -- either escaped Wolbachia into the female line, but I always wondered if it was horizontal as well.

MR. FRANKEL: Your Honor, if the Plaintiff would like the witness to talk about the -- about the exhibit, they should get it into evidence. Other than that, he should not be referencing the contents. Thank you.

JUDGE TONAKI: Agreed. Mr. Vandeveer, he's reading from an article that hasn't been introduced into evidence.

MR. VANDEVEER: (inaudible)

JUDGE TONAKI: I think you've already had some foundational questions.

MR. VANDEVEER: Yes, your Honor.

JUDGE TONAKI: Are you moving this into evidence?

MR. VANDEVEER: Yes, your Honor. At this time Plaintiffs would seek to enter this into evidence under the (inaudible) treatise exception to the hearsay rule.

MS. STEED: Your Honor, we object for lack of foundation.

JUDGE TONAKI: Over the objection of the Defendant, Plaintiffs' 14 will be received in evidence.

(Plaintiffs' Exhibit 14 was received into evidence)

MR. VANDEVEER: Thank you, your Honor.

BY MR. VANDEVEER:

Q So Dr. Pang, can you -- can you discuss sterility in the context of the incompatibility technique?

A Not much is known about the biologic mechanism, but just the results. When you have a mating usually where the Wolbachiaes don't match well, the result is often sterile. And they choose that system, the Wolbachia, that mosquito, that way of inoculating the experimental mosquito to try to either be sterile or not.

Q And are the mosquitoes sterile after the

inoculation or are they still able to breed?

A When they mate, the offspring is sterile. It might not be 100 percent and nobody knows quite how long that will last for.

Q Can you explain that?

A First of all, sometimes when you mate these mosquitoes take Wolbachia to bring out --

MS. STEED: Your Honor?

THE WITNESS: -- IID.

MS. STEED: The State objects to this on the grounds that this doesn't have to do with disease vector, this has to do with how Wolbachia affects an actual mosquito's reproductive organs.

JUDGE TONAKI: Overruled.

THE WITNESS: Sometimes when you mate these things, the fitness of the male -- the male mosquito is not that good. It's very short-lived. So sometimes it's a little tricky introducing these things where they, in nature, don't belong.

BY MR. VANDEVEER:

Q So you have the fitness?

A You have the sterility, which might not be 100 percent, and so you have all these different things to juggle, and the issue was, did you cause horizontal transfer by the mating itself?

Q So --

MS. STEED: Objection. That was not the question that was asked.

JUDGE TONAKI: I don't recall. What was the question, Mr. Vandeveer?

MR. VANDEVEER: I asked Dr. Pang to explain 100 percent sterility and what he meant by it's not always 100 percent sterility.

JUDGE TONAKI: Okay. Answer that question, Dr. Pang.

THE WITNESS: It's a straight answer that these things didn't block all sterility, but there's a -- quite another answer that you made all the offspring sterile, but did you introduce through horizontal venereally that the offspring of offspring would start degenerating.

BY MR. VANDEVEER:

Q And what would happen if, say, one of those offspring mated with a compatible female?

A Oh, then you start the sweep. This was covered by the equations on page 15, the graph on page 9 of Exhibit 12, the Ahmad paper, and he actually explains -- well, tries to -- the balance between horizontal transfer versus sterility, CI. Graph 6B.

MR. FRANKEL: Objection. Move to strike.

Hearsay. Referring to an exhibit not in evidence.

JUDGE TONAKI: (inaudible)

BY MR. VANDEVEER:

Q Why is that important?

A That's important because now you can see how fast and how much horizontal transfer could counteract the CI sterility effect, especially if you needed wild type to -- was more fit to suppress the horizontal transfer, you've eradicated the wild type. It's a double-edged sword.

Q Can you see the possibility for this on the proposed project on Maui?

A Yes, because it hasn't been shown that this does not occur in this mosquito with this Wolbachia, but the paper, 9, 10, 11, 12, showed that this occurred with the white fly.

MS. STEED: Objection.

MR. VANDEVEER: I think I can address this, your Honor.

JUDGE TONAKI: Sustained.

MR. VANDEVEER: Thank you, your Honor.

At this time Plaintiffs would like to show Dr. Pang Plaintiffs' Exhibit 12.

If I may approach?

JUDGE TONAKI: Yes.

MR. VANDEVEER: Thank you, your Honor.

(inaudible whispering)

BY MR. VANDEVEER:

Q Dr. Pang, do you recognize this exhibit?

A Yes.

Q Are you familiar with the contents of it?

A Very familiar.

Q Can you describe what it is?

A This is basically a paper, kind of a lab study where they do is serial predation, and they showed that the mechanism is serial predation, that it infects the white fly -- the predator is the wasp, the target is the wild fly.

So a clean wasp gets it from the first white fly. Then he goes bites another white fly that doesn't die. Then they show you that that white fly that gets infected carries and expresses --

MS. STEED: Your Honor, we object to this line of question and answer right now because the question calls for improper expert opinion. This article has not even been entered into evidence and, moreover, it's not even about mosquitoes.

JUDGE TONAKI: Again --

MS. STEED: So it's of no assistance to the judge.

JUDGE TONAKI: -- the witness is reading off a document that is not entered into evidence.

MR. VANDEVEER: Okay.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q In your opinion, is this a reliable article, Dr. Pang?

A Yes.

MR. VANDEVEER: At this time, your Honor, Plaintiffs would move to enter Exhibit P12 into evidence as an article regarding phoretic vectors for Dr. Pang.

MS. STEED: Your Honor, the State objects. The use of this treatise is improper because the witness simply saying it's reliable does not meet the standard under the federal -- under the HRE.

MR. FRANKEL: Moreover, your Honor, it's beyond the scope of his field of expertise.

JUDGE TONAKI: Well, I think I need to hear more foundation, where this article is from.

Did the doctor rely on it for his opinion --

MR. VANDEVEER: Yes, your Honor.

JUDGE TONAKI: -- Mr. Vandeveer?

BY MR. VANDEVEER:

Q So Dr. Pang, did you rely on this article for your expert opinion today?

A Yes.

Q And why did you rely on that article?

A Well, I -- the source is quite good. They publish in Pathogens. That's where we publish. It has a high index score. And you have researchers from Southern China, South Africa and Cambridge University, and it's quite rigorous and quite quantitative and they address exactly our concerns and show the background in another system, not mosquitoes, that we should think about this in our mosquitoes.

Q And can you tell us again what the concerns are?

A The concerns are that horizontal transfer by serial predation manifests very quickly in the -- in the target, the white fly, on first generation, and that it passes through the fifth generation with high competency, 85 to 90 percent, so it's a -- it's a high thing passing quickly and early and it's stable.

Then, based on that, they go on and model how this horizontal transfer can botch up anybody, any general -- the model's general to CI -- to a CI effort.

Q What year was this article published?

MS. STEED: Move to strike the testimony. Again, your Honor, as for foundation, this is testifying as to what the article says.

JUDGE TONAKI: Sustained.

MS. STEED: Thank you.

BY MR. VANDEVEER:

Q Were there statements in this article that were of use to you in forming your opinion, Dr. Pang?

A Sorry. I didn't -- what?

Q Were there statements -- I should -- sorry. Were there statements or models or graphs in this particular exhibit that were important to your opinion?

A Yes.

Q Did you rely on those?

A Yes.

Q What year was this article published?

A 2015.

MR. VANDEVEER: At this time, your Honor, we would like to enter this into Exhibit -- Exhibit P12 into evidence.

MS. STEED: Your Honor, the State objects to this exhibit being entered into evidence on the basis that the witness has already testified that this is about a different system, which is irrelevant, because a different system is not at issue in this case.

MR. VANDEVEER: If I may, your Honor?

JUDGE TONAKI: Yes.

MR. VANDEVEER: So as Dr. Pang has stated,

this paper not only concerns vectors, but also the general spread that is a concern among scientists and supports his expert opinion as it pertains to this project.

JUDGE TONAKI: Over the objection of the Defendant, Plaintiffs' Exhibit 12 will be received in evidence.

(Plaintiffs' Exhibit 12 was received into evidence)

BY MR. VANDEVEER:

Q So Dr. Pang, can an Incompatible Insect Technique, IIT, what we described earlier, male mate with a compatible female mosquito?

A You mean that has the same Wolbachia -- compatible Wolbachia?

Q That is correct.

A Oh, yes. Yes.

Q Can an IIT male mate with a female carrying the same Wolbachia strain; that is a female accidentally released into the wild?

A Yes. That's the biggest fear.

Q Why is that the biggest fear?

A Because then you have this thing generating in the mosquito line and it's a sweep. You swept the whole thing with all the new Wolbachia, which was never

intended to do.

Q And what would that -- what are the concerns there? What would the impacts be?

A Well, for me, the impact would be that it can occur quickly, not eons, and for me, we don't -- we don't know how this will affect all the other arthropod targets. You know, some are favorable to us, some are not.

Q We humans --

MS. STEED: Objection.

MR. VANDEVEER: Sorry.

MS. STEED: Objection. This is outside the scope of the expert's qualifications regarding other arthropods.

JUDGE TONAKI: Overruled.

BY MR. VANDEVEER:

Q Including humans?

A Yeah, not -- not -- it doesn't affect humans directly, but we like some arthropods and we don't like others.

MS. STEED: Again, objection, your Honor. This line of questioning has already been asked previously as to whether or not Wolbachia directly affects humans. The witness has already testified as to it's indirect, and the Court has already sustained an

objection -- or a motion to strike on having testimony admitted regarding how there's indirect affect on human beings from Wolbachia and other arthropods.

JUDGE TONAKI: Overruled. Go ahead.

THE WITNESS: There is a little more direct effect to -- not in Hawaii, but other diseases.

Not only does it affect the arthropods, but it affects other parasites of humans, filariasis, worms, river blindness and dog heartworm, which is in Hawaii.

When you mess with those worms' Wolbachia, you really have no idea what those worms are going to do. So it's not just arthropods, it's some worms that affect humans. Dog heartworm is one in Hawaii.

BY MR. VANDEVEER:

Q So in this exhibit, this article, you mentioned that there were statements that informed your opinion?

A Yes.

Q I believe you also referenced a graph.

A Yes.

Q Can you describe that?

A Yes, the graph is on page 9. It's actually graph B.

MR. VANDEVEER: Your Honor, is it okay if I publish this? I'm just going to plug my computer in.

JUDGE TONAKI: Which one is that?

MR. VANDEVEER: It's P12.

JUDGE TONAKI: Yes.

MR. VANDEVEER: Thank you.

I'm hoping this doesn't broadcast whatever game's on right now.

It looks like it's working on my end. Let's see here. Source.

I apologize, your Honor.

UNIDENTIFIED SPEAKER: Did (inaudible)

MR. VANDEVEER: Yeah, it's trying to on my end. Let's see.

Well, okay. I'm not sure if the remote's working. I can see my -- that's my laptop but it's not showing what's on my screen.

It's on my screen.

UNIDENTIFIED SPEAKER: (inaudible)

MR. VANDEVEER: It's already on.

Oh, wait. It's trying to --

Oh, yeah, it's trying to go to a different screen. Let's see if this works.

Let's see if this works.

UNIDENTIFIED SPEAKER: (inaudible)

MR. VANDEVEER: It's turned on.

UNIDENTIFIED SPEAKER: (inaudible)

MR. VANDEVEER: I'm trying -- yeah, yeah.

UNIDENTIFIED SPEAKER: (inaudible)

MR. VANDEVEER: Yeah, please.

UNIDENTIFIED SPEAKER: Sorry.

(inaudible conversation)

MR. VANDEVEER: I think you have to split -- there you go. There you go. You're pulling it in. Perfect. So sorry, I was going that way. You were going that way. Thank you very much.

UNIDENTIFIED SPEAKER: You're welcome.

MR. VANDEVEER: Thank you, your Honor.

Oh, dear, what just happened?

You may just need to stand here.

Okay. It may be trying to do it again. A little touchy here. Let's see if I can get this to be the whole screen.

Nope.

I think it might be this.

UNIDENTIFIED SPEAKER: (inaudible)

MR. VANDEVEER: It's pretty hard. This is pretty hard.

UNIDENTIFIED SPEAKER: (inaudible)

MR. VANDEVEER: Okay. There it is. Let's see if this works.

Very touchy.

Hey, Judge, I'm just going to continue, if it's okay, and I'll try to work out the technical issues --

JUDGE TONAKI: Well, I think counsel -- we all have the exhibit so --

MR. VANDEVEER: Okay.

MS. STEED: Yeah.

JUDGE TONAKI: -- was that for the benefit of the people in the gallery?

MR. VANDEVEER: Yes, your Honor.

JUDGE TONAKI: Yeah. I'm sorry, ladies and gentlemen, they're having some technical -- we'll try and iron that out when we break.

BY MR. VANDEVEER:

Q Okay. Continue if you would, Dr. Pang, describing the graph -- I believe you said was --

A Okay.

Q -- on page --

A The graph is on page 9. The point is the graph B, they are pitting the spread of your novel Wolbachia through horizontal transfer against the shutdown of it, cytoplasm -- the IIT method.

And they said that when there's enough horizontal transfer, it will sweep your population, and -- but where is the sweep here?

But you see that those you have at 6B, it spikes up around -- oh, I don't know -- 50 generations. What's a generation? For mosquitoes, maybe 10 days. For his white fly, it's 30 days. Well, what's at 50? Why's it at 100 percent, a sweep?

Oh, isn't there something bad at maybe 20 percent? Yeah, maybe there is, because if this transmits malaria more easily -- avian malaria more easily, there's a cross reference of this, yeah, in the West Nile paper, then qualitatively you've increased the transmission to your birds you're trying to protect. You're not at 100 percent, but 20 percent.

MS. STEED: Objection. As already established, the witness has not been qualified to talk about the transmission of disease to birds.

JUDGE TONAKI: Sustained.

MS. STEED: Thank you.

BY MR. VANDEVEER:

Q Dr. Pang, did you see the concerns that are expressed in this paper addressed anywhere in the final impact statement? I'm sorry, the final environmental assessment.

A Other than the fact they said horizontal transmission either doesn't occur or if it occurs so slowly, we just keep it out of the model.

Q So I want to just take a moment and back up here. When you say generations in mosquitoes are 10 days, can you talk about what that means?

A Egg the egg.

Q Sorry. Say that again.

A Egg to egg. The cycle of egg to egg.

Q Okay. And is that considered an evolutionary change?

A Well, not to me. I mean I thought evolutionary -- it's vague what they mean by that.

MS. STEED: Objection. The witness is not qualified to talk about evolutionary changes in mosquitoes.

JUDGE TONAKI: Overruled.

THE WITNESS: Actually, I didn't know what the time scale -- they shouldn't use the term. Just tell me how long.

BY MR. VANDEVEER:

Q So what is the concern again that is expressed in this paper as it pertains to generations and breeding?

A That this spread could occur sustainably because they carried it through five generations and more rapidly than you think. And the math model is on page 15, and these guys modified the math model to

include horizontal transfer, which I was trying to do, but I'm not sure they included some things I would like to include, so I'd like to talk to them.

Q So in the study, the Maui study --

A Yes.

Q -- the subject of this lawsuit, did they include the horizontal transfer that you just mentioned?

A They only mentioned that it rarely occurs, and if it does, it's so slow, we're not going to worry about it.

Q And does that concern you, Dr. Pang?

A Yes.

Q Why?

A Because this shows that it is -- it can be quite strong and it can appear quickly, and the appearance of it is stable across five generations. It's not going to go away. Your only hope is that it's competed by the wild type, which you just eradicated or are trying to eradicate.

Q Dr. Pang, from your reading of the final environmental impact -- environmental assessment, were you able to tell from the information available how many mosquitoes will be released as a part of this project?

A Yeah, Tina keeps pointing this out to me.

MS. STEED: Objection. That's hearsay.

Additionally, Ms. Lia has not been qualified as an expert and it's outside the scope.

JUDGE TONAKI: Overruled.

THE WITNESS: Truthfully, it's so many I can't remember if it's per day, per week or per month, but it's on the order of three quarter million every --

BY MR. VANDEVEER:

Q Ten days?

A Every week.

MS. STEED: Objection. The witness can't remember the answer. He's guessing.

JUDGE TONAKI: Well, the Court will note that. I don't know if Dr. Pang is guessing at that or do you want to refresh his recollection?

This is off the environmental assessment, right?

MR. VANDEVEER: That's correct, your Honor.

So at this time -- actually, I'll get to that. Thank you, your Honor.

BY MR. VANDEVEER:

Q So Dr. Pang, based on your reading of the final environmental assessment, does the chances for this occurring, what we just described in this article, go up or down with the number of mosquitoes that are being introduced?

A It goes up.

Q I'm sorry. Go ahead.

A It goes up. The more of this IIT you use, the more chance of horizontal transfer.

Q And was that addressed in the final environmental assessment?

A No, because they don't want to talk about horizontal transfer.

Q When you say they don't want to talk about it, can you explain that?

A They said that it doesn't occur or that if it did occur, it's so rare or it's so slow that the birds would have been dead of their own accord before it really has an effect, and then it's -- I just want to see if it's in the math model and I believe it is significant in the math model.

Q And so you're saying this exhibit contradicts that?

A I haven't seen their math model. They don't show me a math model.

Q Oh, I'm sorry.

A They show results but I don't know what went into it.

Q So when you say they did not show a math model, you're talking about the applicant for the IIT

project?

A Yes, I was asked to meet their experts and we did meet. You can show me the result of the math model, but I don't know what it means until I know what went into it.

Q Is there anything else from this particular study, this paper that you relied upon for your expert opinion, that you can point to as something that informs your thinking on this project?

A Well, initially I was looking for a mechanism of horizontal transfer, you know, the common feeding, then the serial predation, and I said, "Okay, serial predation," but I did not realize they would dismiss so easily the effects of horizontal transfer.

Q They being?

A Their experts that they sent me to talk to.

Q For the project on Maui?

A Yeah.

Q And can you describe the --

Strike that, your Honor.

Earlier we talked about vertical transmission.

A Yes.

Q Can you explain what vertical transmission is?

A It propagates through the generations --

MS. STEED: It's asked and answered.

JUDGE TONAKI: Overruled.

THE WITNESS: The Wolbachia is propagating through your population through the offspring, through the congenital -- to the babies, and the babies make more babies, propagating more and more and more, so it propagates that way.

BY MR. VANDEVEER:

Q And what is -- and so the vertical transmission, as you just described it, how does it relate to the project on Maui?

A Vertical transmission, if they did it, would be a sweep, but on Maui they're trying to make it sterile. Vertical transmission would appear if somehow horizontally you got Wolbachia females mating with your introduced Wolbachia males, then we have vertical transmission. Then I don't know how to control that. I don't know the effects and I don't know where it goes. As long as two things are compatible, even though you didn't want it there, you're dealing with vertical transmission.

Q In your expert opinion, based on this article, is additional study appropriate on the issue of horizontal transmission?

A Yes.

Q You mentioned math models earlier, Dr. Pang.

Can you explain the importance of math modeling?

A Sometimes math models aren't too good and I refuse to help them in the further part of my career. There's too many unknowns we put in, and they said the result could be anything. This is malaria coming out of Johns Hopkins. I did not help them.

Then the math models kind of fitted the observed -- observed -- observations, and so we said, "Well, it's useful. Can we push it to predict what will happen?"

This is what we did for rat lung. Our published math model is based on field experience to fit it. Then we pushed it further to handle all the variations you might see in the field. Rat lung is not so different. The disease, rat lung worm versus your malaria. The vector is a slug versus your mosquito. And the target is --

MS. STEED: Objection.

JUDGE TONAKI: -- a human.

MS. STEED: Move to strike that last bit of testimony as it compares a human disease vector with an avian malaria vector, which we've already established he's not qualified to testify as to avian malaria.

JUDGE TONAKI: Overruled.

THE WITNESS: These models that you see

generated across many things. The commonality are the limiting steps on your vectors and your maintenance of your system to protect it. It's pretty standard. Some of these are -- our rat lung model is based on the MIT model of lobster traps. We cited them and we were thanked for that.

BY MR. VANDEVEER:

Q How --

A It spans these systems. All you have to do is fine-tune how quickly it will occur and all these other effects, competing, wild type, fecundity, fertility.

Q But you --

A Look at the prevalence rise. The prevalence rise. But what's the absolute number? Is it five versus 5,000? So there's a lot of thinking that has to be resolved about this. And what's going to kill the birds more, a higher prevalence or just a higher number?

MS. STEED: Objection.

JUDGE TONAKI: Sustained.

MS. STEED: Thank you.

BY MR. VANDEVEER:

Q Dr. Pang, can you explain what a choke point is?

A Oh, choke point. That's when you look at a population --

(Audio from 11:03 to 11:08 not transcribed)
BY MR. VANDEVEER:
Q -- considered a reliable source?
A Yeah, and we had no negative comments so far on it.
Q When you say so far, when was this published?
A About three weeks ago.
Q So does this -- this paper that you published three weeks ago as the senior author, does it inform your opinion regarding math modeling regarding the efficacy of the Maui plan?
A I heard it. Say it one more time. I'm not sure what part you're emphasizing.
Q Does this paper --
MS. STEED: Objection.
MR. VANDEVEER: Sorry.
MS. STEED: Objection. Leading.
JUDGE TONAKI: Overruled.
BY MR. VANDEVEER:
Q Does this paper inform your opinion about the math modeling for the Maui plan?
A Yes.
Q In what way?
A Because this model shows the increase rise as if you first introduced CI, you expect to see something,

and then it shows the limitation when you plateau because all the other impinging factors control your release of CI and the mosquito, so it's a nice dynamic, the initial rise and the final plateau. And we specifically say you can divide the equation up into these two sections.

Furthermore, this thing handled a pilot study already done up in Kula where we saw a great effectiveness and explain it, and it went on to say that people complained about these slugs and it can handle those problems in the field as well. The matter will be self-correcting.

Q So Dr. Pang, if you would, can you explain why this math modeling is important?

A If you can verify it against previous studies and you think it's pretty good, then you can predict pretty -- well, I hope we can predict pretty well what could happen in the future.

What could happen in the future is what you saw in the Singapore model, that things kind of break down and they had to bring more mosquitoes and, you know, what's the problem there? Is it drift in? I don't know, but without a model, you're kind of like -- you got no guidance at least to direct you.

So math models can be very bad if you don't

know what you're putting in. They can be very useful if what you put in seems to make sense and it's based on prior field study, which this was.

It's not the first publication on this topic. The first was a field study, statistics showing it was great. 90 percent effective.

Q In your expert opinion, is it important for scientists to show their work so that other scientists can critique or otherwise analyze?

A Absolutely.

MR. VANDEVEER: Your Honor, at this time I'd like to publish Plaintiffs' Exhibit P -- I'm lost what that was. Sorry.

UNIDENTIFIED SPEAKER: 9.

MR. VANDEVEER: It's 9. 9.

MS. STEED: Your Honor, we assert the same objection. We request an offer of proof. Plaintiff has not shown why this is relevant to the case.

JUDGE TONAKI: Well, are you asking that it be received in evidence?

MR. VANDEVEER: Yes, your Honor.

JUDGE TONAKI: Plaintiffs' Exhibit 9 appears to be something regarding rat lung worm disease where the carriers are slugs.

MR. VANDEVEER: Yes.

JUDGE TONAKI: What relevance does it have to this case, Mr. Vandeveer?

MR. VANDEVEER: The relevance is not the subject matter of the paper, but the math modeling that Dr. Pang has been explaining that is important to this project as well.

MS. STEED: Your Honor, Dr. Pang can testify as to the relevancy of that, but we don't need this exhibit and, moreover, so far there has been no foundation for how a math model relating to slugs carrying rat lung worm disease is at all related to the culex quinquefasciacitus carrying avian malaria Wolbachia.

JUDGE TONAKI: Was IIT -- was IIT done with regard to slugs, Mr. --

MR. VANDEVEER: No, your Honor.

JUDGE TONAKI: The Court's going to sustain the objection and not allow Plaintiffs' Exhibit 9 into evidence.

MR. VANDEVEER: Understood, your Honor.

MS. STEED: Thank you, your Honor.

BY MR. VANDEVEER:

Q Dr. Pang, did the applicant in the final environmental assessment show their work through math modeling?

A Not that I'm aware of. They showed the results.

Q And why is that problematic?

A Because I didn't know what went into the formula, specifically horizontal transfer. The other drifting into the population, drift -- wild drift running were a containment area and not choke points.

Q In your opinion, is additional study needed?

A Yes.

Q Can you describe what biopesticide wind drift is?

A Biopesticide wind drift. I mean I've heard that term. I assume you mean the Wolbachia mosquito drifting out of the area --

MS. STEED: Objection.

THE WITNESS: -- to be --

MS. STEED: The witness is guessing.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q Dr. Pang, do you have any concerns about mosquitoes drifting out of subject area for this study on Maui -- I'm sorry, for the project on Maui?

A Drifting out? First of all, if they drift, the area's in the mid range. If they drift higher, to the higher elevations, I think the mosquitoes will die.

If they drift out to the lower elevations, then you've introduced your IIT project to the lower elevations.

Okay. But what else is drifting? Do you think there's horizontal transfer or not? If you're drifting horizontal transfer male and female Wolbachia, you're going to sweep the lowlands, so now you've got things drifting in or out.

Out means, to me, like could be uphill where it's cold and they all die or out means in the lowlands where they all thrive. That's drifting out. Don't forget they're drifting in.

Q And why is that problematic, in your opinion?

A Which one, drifting in or out, or up or down?

Q Sorry. We'll start with drifting in. Why is that problematic?

A Drifting in, I don't think above the colder elevations there's anything to drift in. They're all dead or they're not there yet. But drifting in from the lowlands, you're essentially bringing in more wild type and now you have to maintain higher proportions of your -- your external release because you're diluting out your effect. This is what the Singapore consortium saw, that it was drifting in. We've gotta step it up, guys, okay? So that's drifting in, diluting out the effect. You also -- both female and female mosquito --

Q (inaudible) efficacy --

A Yeah, yeah.

Q How about drifting out?

A Drifting out. If you drift up to the highlands, I'm not too worried, it's cold, they'll all die. They'll probably die before they come back down. But drifting out to the lowlands, essentially you release your IIT area into new grounds, and if there's horizontal transfer, you're risking a sweep. This is what the Singapore guys saw also.

They couldn't control it in their target sites so they set up these big buffer zones so things wouldn't drift in and hopefully not drift out. And you see them repeatedly redraw the zones. Then talk about core zones protected, but the peripheral zones wasn't.

These zones are kind of vague as things drift back and forth. Not to the highlands. There's nothing coming down and anything going up, too cold and just let them die.

Q And the concern about drift out is a concern about potential impact to the environment; is that correct?

A Yes.

MS. STEED: Objection. Leading.

JUDGE TONAKI: Overruled.

THE WITNESS: There are two kinds of things that might drift out, your own release, okay, but --

MS. STEED: Objection.

THE WITNESS: -- horizontal transfer --

MS. STEED: There is no question that was asked.

MR. VANDEVEER: I believe it's the same question, your Honor.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q Okay. So why is this important, Dr. Pang?

A Because this whole thing was supposed to be contained in an area, but if you can't contain it and things drift out that you worry about, then show me the fallback position, how we're going to contain it once it gets out of hand.

Q And did you see a fallback position in the final environment assessment?

A I really didn't, except that they would stop releasing the experimental males. Things drifted out already.

Q So in your opinion, did that sufficiently address the concern regarding mitigation?

A It could address the concerns if you showed me the math model -- math model, but if you don't see me

the math model, I'm going to assume they would drift off and expand. The math model is essential. It can vary for all kinds of speeds of vectors, all kind of blocks from slugs to mosquitoes to flies. It's a little bit strange to me people disparage it without actually doing one or seeing one.

Q Can you define super infection as it relates to this project?

A Yeah, I think -- to me, I didn't focus on that but I think a target can get multiple Wolbachiaes at once. At once. It can carry two at once.

Q And is that --

MS. STEED: Move to strike. The witness just admitted he didn't examine that.

JUDGE TONAKI: Overruled. Continue if you had more in your answer.

THE WITNESS: And I think one of the references I saw was this -- I think it was one of the references to in item number 9, 10, 11, 12, they talk about aphids getting things horizontally -- horizontal transfer, but they said, "Oh, but look, you could get it vertically too." So two kinds of Wolbachia, one vertically through the, you know -- to vertically and the other horizontally, so that's kind of strange. It's carrying two kinds of Wolbachia. I didn't pay that much

attention to it. I have trouble with one Wolbachia.
BY MR. VANDEVEER:
Q Why would it be important -- why is this important, this notion of super infection of Wolbachia?
A I'm not real sure. I don't know that. I haven't studied that. I haven't thought about that.
Q Was it studied in this final environmental assessment?
A No, I didn't focus on that part.
Q Can you explain what increased pathogen infection means for the mosquitoes in this project?
A So the pathogen would be the malaria, so more malaria to the mosquito. So you want to know is the malaria harmful to the mosquito or not? I don't know.
MS. STEED: Objection. This is about avian malaria. The witness has not been qualified to discuss avian malaria.
JUDGE TONAKI: Well, what type of malaria are you referring to, Mr. Vandeveer?
MR. VANDEVEER: Any type of malaria.
BY MR. VANDEVEER:
Q But specifically speaking if you could address increased pathogen infection in mosquitoes and how it might impact humans?
A Yeah, the human one, I don't really know.

We've been looking at it. Maybe when the mosquito gets the human, malaria dies; however, in that Exhibit 9, 10, 11, 12, that model on page 15, that equation, it has to do with survivability. Is it better for the mosquito to get malaria or not? I don't know. I would like to see that in the model if somebody thinks it's significant.

Q Are there any viruses that can affect humans and birds?

A Oh, yeah. Yeah.

Q Can you name an example?

A Bird avian flu. Now, the vector happens to be airborne, not mosquitoes, but, you know, we know pretty well in this case the birds give it to birds. The vector is the air. And then the birds might come here to Hawaii and give it to us. So is the bird a vector? It kind of gave it to us. Or is it the host? So the lines get kind of blurred when it's transferred among hosts, so we know pretty well human, bird, because of avian flu, and West Nile.

MR. VANDEVEER: Your Honor, I'd like to show the witness Exhibit P13.

MS. STEED: The State would like to ask for what purpose?

MR. VANDEVEER: To refresh his recollection regarding viruses affecting humans and birds.

THE WITNESS: Is that West Nile?

JUDGE TONAKI: You may.

MR. VANDEVEER: Thank you.

THE WITNESS: 13. That's West Nile.

BY MR. VANDEVEER:

Q Do you recognize this exhibit?

A Yes. Yes. Yes, I do.

Q Can you describe what it is?

A It's a study where, in the lab, they inoculated the mosquito culex with Wolbachia and found that it -- it up-regulated the West Nile carriage and transmissibility because it was in the saliva as well. So they said this is unusual. Most times Wolbachia will down-regulate the human pathogens, dengue and things like that, but here's one where it up-regulates, but they admitted that the way they made the culex Wolbachia lab might not be the real way it gets it in the environment, vertical transfer, horizontal transfer, so be very careful on the way you inoculate your mosquitoes.

Q Did you rely on this opinion -- on this article in forming your opinion?

A There's quite a few human diseases where it down-regulates and here's one where it's up-regulated, so it just brought to mind --

Do you see the last author, Jason Rascon? He said in another publication, be very careful. The effects are very specific to what kind of Wolbachia, what kind of mosquito or variant of mosquito. What are you trying to manipulate, sterility, up-regulating, down-regulating? And how did you inoculate that mosquito, in the lab or was it in the wild or was it through common feeding sources?

Q Let me just back up a little bit, Dr. Pang. Do you find this article reliable?

A Yeah, yeah, for what it says and their preservations that what they did in the lab might not extrapolate out into the field.

Q So you're familiar with the findings in this article?

A Yeah. Yes.

Q What year was it published?

A What year? Oh, gosh. 2014.

Q And did this article -- I'm just going to ask specifically, did this article specifically inform any of your opinions about transmission?

A It was a little curious because this is -- this is one of the first we know that it up-regulates a disease, but there's a lot we know that don't. But the point is that it's very specific what it would do, based

on those four things that the senior author Rascon said long ago in another publication.

It's very difficult to extrapolate, but in the name of precaution, you kind of worry that these things might happen, so it's unfair -- you have to -- their side has to show that these things don't occur in our system. We could say but they might occur because they occurred in another system. That's precaution. That's how we do cancer screening in animals. We extrapolate from animals to humans.

MR. VANDEVEER: Your Honor, at this time I'd like to enter into evidence Plaintiffs' Exhibit 13.

MS. STEED: The State objects on the grounds that this -- this exhibit lacks foundation. We don't know who published it, we don't know if it's peer reviewed, et cetera, and him -- the witness saying it's reliable does not actually make it reliable.

JUDGE TONAKI: Over the objection of Defendant, Plaintiffs' Exhibit 13 will be received in evidence.

(Plaintiffs' Exhibit 13 was received into evidence)

BY MR. VANDEVEER:

Q Dr. Pang, can you elaborate on what you just mentioned about precaution?

A The precautionary principle means when you're about to release something that you really don't know, either individual human or system, community, that you are allowed to say these things might happen so can we be sure they don't happen, the side effects. So that gives us room to extrapolate that I saw it happen in this animal. I wonder if it could happen in humans.

This is standard when we screen drugs. We have animal models. When we look at vaccines, we have animal models. And by God, if you saw something weird in the animal, you would suspend or pull those studies on humans. So you are allowed to extrapolate cross species and different settings.

But the other side has to show that he saw it in dogs. I better check to make sure it doesn't happen in humans. You must show that it doesn't happen. You can't say, "Well, we don't have data to show that it' in humans." That's vague. You either didn't do the study or you did the study and showed it wasn't occurring. That's fine.

Q And in your opinion, your expert opinion, was the precautionary principle followed in the project on Maui?

A Well, let me just think now. Where the things that could occur in these other animal systems, you

know, aphids and ants and all. Well, they said they don't apply. You can't cross species.

In precautionary principles, you can. And it's up to the person giving the statement to say, "I think they should. This thing did cross quickly sustainably in the white fly, in that system, in this system." So could they occur in the mosquito? And you don't get to say, "Well, we have no evidence to say it doesn't." You either have evidence to show it doesn't, which is good, or you don't know. That's a vague statement. We have no evidence to show that it occurs. That's a non-scientific statement.

Q So did you see what you just described?

A No, I haven't seen -- when you said these things -- sorry. I haven't seen -- when they say these things don't occur, I haven't seen the studies, and if I saw the studies and they said they didn't occur, zero, you'd give me confidence intervals on that estimate of zero, wouldn't you, that they don't occur. Uncle Joe, there's no side effects. Well, I didn't see it. Well, how many did you look at? Ten, so there's zero. What's the confidence interval of zero? It ain't zero, it's zero to 30 percent in ten people. Scientists will ask you for the confidence interval of your estimate, and that means you did a study, so I didn't see confidence

intervals. In the statements, these things don't occur.

Q I'll ask you again, Dr. Pang, did you see an explanation regarding that element of the precautionary principle in the final environmental assessment?

A No, and the justification was they occur on an eon evolutionary scale or that it's so rare, we're just going to factor them out of the equation.

Q And in your opinion, was that proper?

A No. No. At least put it in an equation so we can discuss it, because the Singapore people saw Wolbachia in the females and the larva offspring in an IIT project.

Q And in your opinion, is more study needed to understand the environment impacts on this issue?

MS. STEED: Objection. Asked and answered.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q What are the important take-aways that informed your opinion from this particular West Nile infection study?

A Well, first of all, they like to say, "We're the first to show that it up-regulates some disease." I'm not so impressed with that. Thankfully we don't have West Nile here. We don't know why, but we surely have the vector.

But then I like their discussion to say, you know, realize that we made our transfer in the lab. That might not be what's going on in nature. That's true. If Wolbachia went through our mosquitoes vertically, it might be different. It might not up-regulate, but there's another wild card here. There's a lab inoculation. There's a vertical transmission if it occurs, and then there's horizontal transmission. Do you think horizontal transmission is more like the lab or more like vertical? We don't know. And what horizontal transmission, through common feeding sites or serial predation? I don't know.

MS. STEED: Move to strike. We've already established that Dr. Pang is not qualified to talk about transmission through feeding sites or predation.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q To the best of your knowledge, Dr. Pang, does the wPip4 strain of Wolbachia exist in the wild on any of the Hawaiian Islands?

A I don't know. I didn't pay attention to that.

Q In your opinion, Dr. Pang, is this project a novel experiment?

A There's a lot of unknowns and it's just a degree how novel is it. We -- I've studied pretty well

the sweeps in Brazil where you want it to take over, but only now, like the Singapore study, kind of recent, to try IIT to control through sterility.

Even the Singapore study encountered quite a few unknowns that they kind of scrambled to explain, and it's a very different setting, high urban density against a very different mosquito vector.

Q Were there any studies that you relied upon that referenced somatic transfer in Wolbachia?

A Somatic transfer. That means the body cells, not the germ cells. If you give it into the body cells, that's horizontal transfer.

But the question is does it pass from the somatic cells into the germ cells ready to make the next generation Wolbachia compatible with the males you've just introduced, so the study was by Friedman, second exhibit, yeah.

MR. VANDEVEER: Your Honor, at this time I'd like to show the Plaintiff -- I'm sorry, the witness Plaintiffs' Exhibit 10 to refresh his recollection regarding somatic transfer of Wolbachia.

Thank you.

THE WITNESS: The study published in Nature by Friedman out of Princeton University. I have no conflict of interest with Princeton. Kind of a key

study and this was published in, I think --

BY MR. VANDEVEER:

Q I'll ask a question, Dr. Pang.

Do you recognize this article?

A Yes.

Q Can you describe what it is?

A It's a lab transfer into the fruit fly system transferring it somatically and watching how and how quickly it spreads into the germ cells of the fruit fly.

Q And who are the authors?

A The author is -- the first author is Friedman and then some other authors, but it's Princeton University.

Q Can you read the other authors that are part of this?

A Jennifer Lee, Drew Robson and Eric Weishaus (phonetic)

Q And are you familiar with this study?

A Oh, yeah.

Q Do you consider this a reliable source?

A Yes, it's published in Nature.

Q Sorry. Published in what?

A The journal Nature.

Q Okay.

A Which is quite reliable -- until Covid.

Q And did this help you derive your opinions in this case?

A Yes.

Q How?

A This is the first article I saw that said how quickly a transfer from somatic to the germ cells egg cells -- egg cells, eight to 15 days.

MR. FRANKEL: Objection, your Honor. This article is about fruit flies. It's not in evidence, yeah.

MR. VANDEVEER: If I may, your Honor?

JUDGE TONAKI: Are you laying a foundation?

MR. VANDEVEER: Yes, your Honor.

BY MR. VANDEVEER:

Q Can you explain why somatic transfer is significant to your opinion?

A Other than the fact that it might hurt your target -- you know, make them ruin their muscles and all -- if it gets into their germ cell line, their offspring will be compatible with the IIT intervention you brought. You've brought in males. Now this produces the females and you're off to a sweep. And it shows that the transfer -- what I was told is so slow, "Gee, it occurs eight to 15 days after inoculation of the mosquito."

MR. VANDEVEER: Your Honor, at this time Plaintiffs would ask to admit Exhibit P10 into evidence.

MS. STEED: The State objects on the basis that this is not -- relevance. There's been no testimony to show that somatic stem cell research in white flies is relevant to mosquitoes.

MR. VANDEVEER: Because it hasn't been done, your Honor.

MS. STEED: Again, relevance.

JUDGE TONAKI: I'll sustain the objection.

MS. STEED: Thank you.

JUDGE TONAKI: I'll allow Plaintiffs' 10 into evidence.

(Plaintiffs' Exhibit 10 was received into evidence)

BY MR. VANDEVEER:

Q So did this -- did this article that's not in evidence -- actually, let me back up, Dr. Pang.

Can Wolbachia travel, in your expert opinion, from the somatic cells of the body to the germ cells?

A Yes. This shows the pathway in the fruit fly.

Q Why is that important?

A Because it was always thought that we could hold things from our germ line, but this shows that there's a propensity through the dengue cells, I think

somatic stem cells, kind of germinal cells, targeting the eggs to the ovary system in the females.

Q And why is it important in the context of this project?

A It shows that horizontal transfer --

MS. STEED: Objection.

THE WITNESS: -- can be fast.

MS. STEED: This is not in evidence.

JUDGE TONAKI: Overruled.

THE WITNESS: It shows that horizontal transfer can be fast. If it didn't show it, if it showed it was long, then I wouldn't be so concerned that it's not in mosquitoes, although I could, like, say, "Well, what do fruit flies have to do with mosquitoes?" We can play it both ways, but this shows and the other one -- the white flies shows a rapid transfer and is sustainable.

BY MR. VANDEVEER:

Q So is it --

MS. STEED: Your Honor, move to strike that testimony. Plaintiffs have not laid a foundation to show how somatic cells operating in white flies have any relevancy to mosquitoes considering they're two completely different systems.

JUDGE TONAKI: Overruled.

THE WITNESS: This is somatic stem cells operating in fruit flies. The white flies just showed that it went into the subsequent generations and held, and it went quickly in high numbers. It wasn't shown in the white fly because they didn't do this kind of study. You know what I mean? Tracking dengue type of cells that travel or target the germ cell.

BY MR. VANDEVEER:

Q How about in mosquitoes, Dr. Pang, in the female that now has Wolbachia in her germ cells, is she now able to breed with a lab male?

A I assume so. That was their biggest concern.

MS. STEED: Objection. It lacks foundation.

JUDGE TONAKI: Overruled.

BY MR. VANDEVEER:

Q Go ahead.

A I assume so. That was compatible. You lost your -- IIT is called cytoplasmic incompatibility. It keeps it sterile. You are now compatible and you are aiming for a sweep, you're heading for a sweep. Unless you're going to show me that the female is compatible, but it's weak, it's not fertile, so that was the equations that have to be resolved. I believe they're fertile, I believe they're not weak and it shows that the subsequent -- what do you call? -- generations are

robust 85 to 90 percent transferable Wolbachia.

Q Can female mosquitoes breed more than once?

A Oh, yeah. You mean mate and lay eggs?

MS. STEED: Objection. Dr. Pang has not been certified or qualified as an expert in how mosquitoes reproduce, only in --

JUDGE TONAKI: He's an expert in vector so overruled.

BY MR. VANDEVEER:

Q Go ahead, Dr. Pang.

A Yeah, they take a blood meal -- once they're adult, they take a blood meal every three or four days and they lay a batch of eggs for the rest of its life. I don't know. It depends on temperature and all. Maybe 30 days.

I worked in the field on malaria, human, and by my side were the entomologists telling me all this stuff, ten years.

Q And did you see this somatic cell transfer in the germ cells, this issue mentioned at all in the final environmental assessment for the project on Maui?

A No, as far as I'm concerned, the publication by Friedman wasn't brought up.

Q Why is that important?

A Because it shows that the transfer can occur

in the fruit fly rather quickly.

Q In your expert opinion, should this have been -- should this have been studied?

A Yes. Even in the lab, at least in the lab, show me this doesn't occur in the mosquito, in our target mosquito.

Q In your expert opinion, were alternatives to this project adequately considered in the final environmental assessment?

MR. FRANKEL: Objection. Lacks foundation. Calls for legal conclusion.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q Are you familiar with the World Mosquito Program population replacement?

A No, no, I'm not familiar. I might have seen their name in passing but I haven't studied them further.

Q Did you offer any alternatives to the applicant for the biopesticide experiment on Maui --

A Yes.

Q -- the subject of which --

A I did offer publicly on the radio when I was interviewed in Kauai.

Q And were any of your alternatives -- did

anyone contact you, I should say, based only that?

A No. Actually, my colleagues talked me out of it, but I thought it was a good idea and I just sent them a rebuttal to say, "We don't have to be so invasive. There's a good alternative." And the malaria -- human malaria people consider it now.

Q Can you explain what you mean by that?

A The alternative or the -- the alternative?

Q The alternative, yes.

A We're going to have to resort to human malaria. Human malaria goes between man mosquito, man mosquito, man mosquito, okay? The mosquito just wants a blood meal so if the mosquito bites a cow, well, the cows don't get malaria. What the mosquito gave to the cow won't propagate. Cows don't get human malaria and it couldn't have gotten malaria from the cow, so it dilutes it out.

So the Africans discovered this anecdotally when they have fever where malaria is endemic. They drive their cattle under their house. The mosquito bite the cattle and their human malaria goes away. You diluted out of the cycle, okay? Good. So that was called zooprophylaxis and later described by the British, so you can dilute it out.

Add to that now -- to the cattle, you could

add a malaria drug, Primaquine, which is exquisitely good at killing all stages of the mosquito. So the mosquito gets malaria. It takes -- I don't know -- eight to ten days to develop. It will kill all the stages. So not only does the mosquito dilute it out by biting the cattle and not getting human malaria from the cattle, but if you dose your cattle with Primaquine, you've cured all mosquitoes that bit it? Okay.

So they said, "Ah, you know, what if the cattle die of Primaquine?" Primaquine is quite safe. I offered to buy the cattle and call it Pang's cattle and dose it with Primaquine. That fell out of favor because of the big push not scientifically because, "We're going to invent a vaccine, Dr. Pang." And now that the vaccine is --

MS. STEED: Objection. Hearsay.

JUDGE TONAKI: Overruled.

THE WITNESS: Now that the vaccine's not here, this has resurfaced again. In theory, you could not go after the mosquito, but go after its malaria if every time it took a blood meal, it bit an animal that had Primaquine. People told me, "Don't take these animals up there's. It's already endangered." Fine. How about the portable blood meal thing that this -- not taking animals, but blood packets and then feeds.

Or you can move your animals far from the site because of the ranging distance for a blood meal can be very long for the female mosquito. I think in the Galapagos, it's approaching four miles for one bite of a mosquito, culex, and for the other type of mosquito, 16 miles. So you can put your animals way out of the zone and they feed, cure malaria and go back, and plenty mosquitoes, you're giving them blood, but no malaria.

BY MR. VANDEVEER:

Q Is the IIT method that's used globally that's generally, I believe, referred to as the sweep method --

A No, no, it's the other way around, but go ahead.

Q Is the IIT method that's used globally different than the Maui project in any way?

A No, the IIT method is the -- is the sterility method. The IIT method is not called the sweep method. Sweep is the whole thing takes Wolbachia so you release male, female. The IIT is you wiping out all the mosquitoes, period.

Q And what is that method known as?

A The first or second one?

Q The second.

A That's called the IIT and it's also called -- I used to call it cytoplasmic incompatibility, CI.

Q Is it also referred to as a suppression method?

A Yeah, but there's different forms of suppression. Yeah, I mean it's a specific introduction of Wolbachia because it's incompatible -- the matings are incompatible so sterile offspring.

Q In your review of the final environmental assessment, did you note any conflicts of interest that had been disclosed?

MS. STEED: Objection. The expert is not qualified to discuss issues of conflict of interest. Also that calls for legal conclusion.

JUDGE TONAKI: Sustained.

MS. STEED: Thank you.

BY MR. VANDEVEER:

Q In your own line of work, Dr. Pang, when publishing an article, do you disclose your conflicts of interest?

A Yes, it's by law.

Q Are you aware of any conflicts of interest of any of the partnering agency employees, board members, contractors or representatives of this project?

MS. STEED: Same objection.

JUDGE TONAKI: Overruled.

THE WITNESS: There has been a redefinition of

conflict of interest in 2009 by the Institute of Medicine, and it's to expand scientific fields outside of medicine.

And the definition -- the old definition was, you know, this guy got a kickback. They said beyond financial interests to one person, it will extend to your family, friends, colleagues -- colleagues and students, and it's more than kickback, it's promotion of a career, your standing in society and one more thing I can't remember, but you see how extensive it is, okay?

So you did something because you influenced the promotion of the career of your colleague. That's the Institute of Medicine has not been rebutted. They did not take this lightly. Very senior people in 2005 said, you know, "We have conflict. Who doesn't? And we could set this aside."

It was shown in the New England Journal of Medicine you're either delusioning -- delusional or you're lying, so that's why the Institute of Medicine four years later had to formulate this opinion.

So when you ask me conflict of interest, are we going by my definition, Institute of Medicine, or by the old definition, direct kickbacks to the person?

BY MR. VANDEVEER:

Q Dr. Pang, in your expert opinion have the

concerns you've addressed here today been studied enough for the State and its agency partners to move forward with this project?

MS. STEED: Objection. Asked and answered.

JUDGE TONAKI: Overruled.

THE WITNESS: I think of myself as a reasonable person. The birds are in crisis. I don't want to drag this out. If you want to make a move, try to make the best move you can, but is there something we can do quickly in the lab to calm the fears that this will be effective and we will not have side effects? Can we move quickly? We had to do this for Covid.

BY MR. VANDEVEER:

Q As it is currently being proposed in your expert opinion, has this experiment been studied enough for the State and its agency partners to move forward?

A No.

MR. VANDEVEER: Thank you, Dr. Pang.

No further questions, your Honor.

JUDGE TONAKI: Okay. We're close to the lunch hour, so we'll take our lunch break.

Before we break, assuming we're not going to finish the hearing today, I want to give the parties some additional dates so you can check with your witnesses perhaps during lunch.

The first additional date would be August 11th for a continued hearing, so that's a Friday, Friday, August 11th from 9:30 to four.

MS. STEED: Your Honor, I actually have a settlement conference and an MSJ hearing on the calendar that day. I'm hoping I will not have to the attend either, but if you have other dates, that might be best in the event I have to attend.

JUDGE TONAKI: I have one other date, Tuesday, August 15, and that will only be in the afternoon from 1:30 to four.

MS. STEED: Your Honor, that's fine for the State.

MR. VANDEVEER: That works for Plaintiffs as well, your Honor.

JUDGE TONAKI: If you could check, Ms. Steed, on the 11th?

MS. STEED: Yes, your Honor, I --

JUDGE TONAKI: If you can have someone stand in for you?

MS. STEED: Oh, I apologize, your Honor, I'm the only attorney on that case -- on those two cases.

JUDGE TONAKI: Oh, okay.

MS. STEED: I will know -- I will know in -- I should know on August 4th, which is probably too late.

It's dependent on if I win a summary judgment motion.

JUDGE TONAKI: Okay. So why don't we just agree on the Tuesday, August 15 from 1:30 to four, and then I can look for an additional date.

MS. STEED: Thank you, your Honor.

JUDGE TONAKI: Okay. Okay. So we'll take our lunch break. If we can reconvene at one o'clock?

THE BAILIFF: We stand in recess. The Court stands in l.

All rise. The Court stands in recess.

(Recess was taken)

THE BAILIFF: This Court is reconvened. You may be seated.

JUDGE TONAKI: Okay. We're back on the record in the Hawaii United versus DLNR.

And I would ask --

Dr. Pang is still on the stand.

Cross-examination?

MS. STEED: Yes, your Honor.

JUDGE TONAKI: Okay. Go ahead.

CROSS-EXAMINATION

BY MS. STEED:

Q All right. Good afternoon, Dr. Pang. Are you ready to go back on the record?

A Yes.

Q Okay. The State just has a few questions today on cross-examination for you.

First, previously this morning on direct examination you testified to having alternatives that you thought that the environmental assessment should have considered in the proposed project; is that correct?

A Yes, that's -- that's -- oh, God. Yes, that's correct.

Q Okay. And in your testimony, you compared -- well, you compared this project to using cattle to control mosquitoes carrying human malaria; is that correct?

A Correct.

Q Now, the alternative that you were referring to in your testimony this morning, was that in reference to using rabbits to control avian malaria?

A Rabbit blood source, yes.

Q Could you please explain what your alternative was using rabbits?

A Okay. First of all, the existing EA pretty summarily dismissed antimalarial drugs to catch the bird and treat the bird. We agreed that that was not -- you know, that was not great, you traumatize the bird.

So what the plan was to get the rabbits -- lab-raised all-male rabbits -- put them out there where the mosquito -- female mosquitoes would bite them, and the mosquitoes would get their blood source from the rabbits, and they wouldn't get malaria from rabbits because they don't carry avian malaria, and if they had avian malaria, the mosquitoes, they would give it to the rabbit and dilute it out.

I was going to add on Premaquine because it pretty exquisitely treats all stages -- and I think avian malaria too in the mosquito, so not only are you diluting out the malaria affecting the rabbit, but you're curing all mosquitoes of avian malaria.

Q Thank you, Dr. Pang.

And getting to that point of using a drug in the rabbits to cure the malaria, do you know of any studies that show that that specific drug that's used to treat human malaria in cattle can be used to treat avian malaria in the culex quinquefasciacitus mosquito?

A I don't know but I haven't looked extensively.

Q Okay. Thank you.

And then the next question, were you proposing that the rabbits just be released into the wild?

A No, they would be held in cages --

Q Okay.

A -- and they're fed. But then we thought, well, are you going to put the cages in these sites and how frequently and how often are you going to visit them? So I thought, "Yeah, maybe you're right. That was a little extreme."

But then I find that the female mosquito for blood-seeking can go quite a distance. It's not the same as the short distance for sugar feeding. So I thought we could put it on the periphery. Now, I never did a study on these things, but the Galapagos has published papers on this.

Q Okay.

A They had the same problem.

Q So using the -- the Galapagos uses rabbits for the culex quinquefasciacitus?

A No. They identified two other mammals, man and, I think, pig.

Q But not rabbits, correct?

A Not rabbits.

Q Okay.

A I chose rabbits because in the lab that was the best target.

Q Okay.

A They would feed preferentially.

Q And in the location of rabbits, putting them

on the periphery, did you think that it was not feasible to place rabbits throughout the entire landscape where the project was proposed?

A Yes, that's correct.

Q Okay. And so with these rabbits, they would -- is it correct to say that under your alternative theory they would only be located on the periphery?

A Correct.

Q And do you -- do you know how wide ranging the landscape that is targeted in this project is?

A You mean the area?

Q The size, yes.

A Sorry. The area. I was just drawing a rough figure, you know, about ten percent of the land of Maui, so that would be about 60 square miles.

Q Okay. And how many rabbits do you think it would take to cover the 60 square miles under your alternative?

A On the periphery. On the periphery.

Q On the periphery, yes.

A So I haven't looked at the circumference and the shape, but then if --

Q Okay. So then is it fair to say you don't know how many rabbits it would require?

A Well, we can give rough estimates, but I don't know the shape --

Q Okay.

A -- of the 60 square miles.

Q Okay. Now, we've heard at length about Wolbachia during your testimony this morning.

Is it correct that Wolbachia is not a known human pathogen?

A Correct.

Q Okay. And is it also correct that the West Nile Virus is not in Hawaii?

A That's not correct.

Q There have been studies detecting West Nile Virus?

A Yes, we did the studies, the airport. It was in our mosquitoes, and then we have imported cases from Colorado, et cetera.

Q Okay. But in the Haleakala Forest, there is no documented West Nile Virus?

A Well, we haven't looked really.

MS. STEED: Okay. Thank you.

No further questions from the State. We reserve the right to call Mr. -- Dr. Pang, as needed.

MR. FRANKEL: Your Honor, just a couple questions.

MR. VANDEVEER: Sorry, your Honor. Point of clarification. This morning we talked about not having two attorneys. Is that -- is that only on direct or is that on --

JUDGE TONAKI: We were advised that because their understanding, it was on their --

MR. VANDEVEER: Understood.

JUDGE TONAKI: -- so -- but I -- with the proviso that I don't want them covering the same areas.

MR. VANDEVEER: Understood. Thank you, your Honor.

MR. FRANKEL: It will less time than we just took.

JUDGE TONAKI: Mr. Frankel, yes.

MR. FRANKEL: Thank you.

CROSS-EXAMINATION

BY MR. FRANKEL:

Q Dr. Pang, you're not a lawyer, right?

A No, I'm not a lawyer.

Q So you don't know if the law requires that an environmental assessment include a mathematical model?

MR. VANDEVEER: Objection, your Honor. Calls for legal conclusion.

JUDGE TONAKI: Overruled.

THE WITNESS: I don't know.

MR. FRANKEL: Thank you. No further questions.

JUDGE TONAKI: Any redirect?

MR. VANDEVEER: Very briefly, your Honor.

REDIRECT EXAMINATION

BY MR. VANDEVEER:

Q Dr. Pang, was your opinion regarding the concerns that you've addressed in court today that the project was not studied enough for the State and agency partners to move forward because the applicant did not select the alternative you proposed?

A No. Even when I removed my request for the alternative and not to study it further, I still stand that the actual intervention itself has questions.

MR. VANDEVEER: Thank you, your Honor. No further questions.

JUDGE TONAKI: Any recross?

MS. STEED: No, your Honor.

JUDGE TONAKI: Okay. Thank you, Dr. Pang. You're excused as a witness.

THE WITNESS: Okay.

(The witness was excused)

MR. VANDEVEER: Your Honor, Plaintiffs call

their next witness, Tina Lia to the stand, please.

JUDGE TONAKI: Ms. Lia, we're going to administer the oath.

THE CLERK: Do you solemnly swear or affirm that the testimony you are now about to give shall be the truth, the whole truth and nothing but the truth?

MS. LIA: I do.

THE CLERK: Thanks.

JUDGE TONAKI: Ms. Lia, if you can speak directly into the microphone loudly so we can get a good recording, thank you.

TINA LIA,

having first been duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. VANDEVEER:

Q Good afternoon, Ms. Lia.

Where do you live?

A In Kihei on Maui.

Q And how long have you lived there?

A 24 years.

Q Where do you work?

A I have my own consulting business, so I work all over the island doing primarily administrative and

bookkeeping work.

Q Do you do any volunteer work?

A Yes, I've done volunteer work for many years for different organizations and just community groups.

Q Can you tell us about the nonprofits you've worked for?

A I've done volunteer work and consulting work with a few different nonprofits and a couple of environmental nonprofits. Specifically that was starting back around 2006.

And that first nonprofit's called Community Workday. It's an affiliate of Keep America Beautiful. They do litter cleanups and beach cleanups and recycling programs and community gardens and education.

And I also worked with Sharing Aloha which does recycling programs and education with warm composting workshops and they put on the Art of Trash Show annually every year with the recycled artwork and fashions.

And I've worked for other --

(Audio from 1:12 to 1:17 not transcribed)

THE WITNESS: -- Makawao Forest Reserve that I do frequent and Hosmer's Grove, which appears to be up against the project area and possibly partially part of it. I can't quite tell. But those are areas I

frequent, Kipahulu, and Hana side. It just, you know, was the whole expansive East Maui, and so, to me, it seemed like a pretty big project to undertake for something that already had sounded experimental to me at the time.

BY MR. VANDEVEER:

Q And did you seek out any more information once you had heard about the project?

A Yes. I started looking at the state and national websites related to the project. I looked into the World Mosquito Program to find out more about Wolbachia mosquitoes, which they actually use a different technique, but there was still information that was useful, and different online sources mostly of the agencies involved themselves, the Maui Forest Bird Recovery Program and, you know, the agencies that we're speaking about the project, I wanted to know more about why it was happening and details about the project.

Q Did you understand the science behind the project when you first became aware of it?

A I didn't really understand the details completely, but I had heard about the Wolbachia mosquitoes because I've been following, you know, some of the different stories in the news about mosquito releases over the last several years, probably the last

ten years. It's something that I've definitely been concerned about and wanted to know more about, so I was aware that there were these Wolbachia mosquitoes.

At first, we didn't know that that's what they were planning to use here, and actually when the information first came out through our network, it was, you know, they're bringing GMO mosquitoes and that's, of course -- you know, I was concerned about that.

And then pretty shortly after that, the State, I think, had presented updated information to let people know it was the Wolbachia mosquitoes, and I was still concerned about that because that's a bacteria and, you know, mosquitoes are a disease vector, and it was something that I wanted to know more about.

Q Do you recall when the State presented the information that you just referenced?

A I'm going to say it was shortly after we were first alerted about it, so either in June or possibly early July, but probably, you know, within a week or two of pushback from the community when they thought it was the generically modified mosquitoes. A lot of people testified. I think that was at a Department of Agriculture board meeting.

Q This would have been in 2022; is that correct?

A Yes, yeah.

Q Did you contact anyone to help better understand the science behind the project?

A Yes. That's actually when I contacted Dr. Pang, which I believe was either in June or July of last year.

Q And why did you contact Dr. Pang?

A Because I know that he's a tropical disease expert and that he knows about mosquito-borne illnesses, and because I respect his opinion, and I know that he stays neutral, and that if I had concerns, that he would either help me not be so concerned about it by explaining that, you know, "No, this is probably okay and this is why," or he would help me to understand what could happen with those concerns. And I just knew that he would be neutral and have the solid background. And he's actually the person on the -- all of the islands that they usually go to for mosquito-borne --

JUDGE TONAKI: Hold on.

MS. STEED: This is both a narrative answer and improper testimony about Dr. Pang's qualifications. He's already been on the stand.

JUDGE TONAKI: Sustained. Calls for a narrative.

BY MR. VANDEVEER:

Q How did you know Dr. Pang?

A I met him when I was working with the Community Workday. They're now called Malama Maui Nui. That's the environmental nonprofit affiliate of Keep America Beautiful. I think around 2009 we met. He's been on their board for many years and we worked on a federal grant together.

Q And did Dr. Pang agree to speak with you as a private citizen about the Wolbachia mosquitoes?

A Yes, he did.

Q Did you ever submit written testimony regarding the birds, not mosquitoes, Wolbachia release plan?

A Yes, I submitted testimony a number of times to the Board of Land and Natural Resources, I believe to the Department of Agriculture as well when we first heard about the project, but definitely to the Board of Land and Natural Resources several times.

Q And were you ever made aware of something called horizontal transmission?

A Yes.

Q And did you testify as to that?

A I did. I included it in my testimonies, yeah.

Q And what was the response to that?

MS. STEED: Objection. Calls for hearsay.

MR. VANDEVEER: I'm sorry. I'll withdraw that

question, your Honor.

JUDGE TONAKI: Thank you.

BY MR. VANDEVEER:

Q What was your concern that you testified about, Ms. Lia?

MR. FRANKEL: Objection, your Honor. Relevance.

JUDGE TONAKI: Overruled.

THE WITNESS: My concern was that they had not studied that at all. It didn't appear to be referenced at all in their draft environmental assessment. And, you know, based on what I had learned about it, it was something that could -- you know, if it hadn't been studied in this particular mosquito, which it doesn't appear that it has because no one has presented that information --

MS. STEED: Objection.

THE WITNESS: -- um.

MS. STEED: Objection. Ms. Lia is not testifying as an expert witness. It's not proper for her to testify as to what has or hasn't been studied.

JUDGE TONAKI: Yeah. Mr. Vandeveer?

MR. VANDEVEER: So --

JUDGE TONAKI: She can testify as to what her testimony was before the --

MR. VANDEVEER: Understood, your Honor.

BY MR. VANDEVEER:

Q If you could, please just answer the question.

A Yeah. So in my testimony, I explained that the bacteria -- the Wolbachia bacteria could transmit horizontally in the environment to other insects, including insect vectors of disease.

Q Did you testify about any --

Sorry. Did you have any concerns about birds being harmed by the project?

A Yes, I did, because I learned during that time period that there was a peer-reviewed study showing that the Wolbachia could cause the mosquitoes to become more capable of transmitting avian malaria, and there was another study showing they could become more capable transmitting West Nile Virus, which not only humans can get but birds can get also.

MS. STEED: Objection. Move to strike that testimony. It was in reference to what birds can and cannot contract. Ms. Lia is not an expert as to avian disease.

JUDGE TONAKI: Overruled. The Court understands that Ms. Lia is not testifying as an expert witness, but testifying as to what she conveyed to the Board in her testimony.

BY MR. VANDEVEER:

Q Ms. Lia, did you testify about any disease research regarding -- or concerning Wolbachia that concerned you?

A The disease research that I just referenced, the avian malaria and the West Nile Virus. There were other studies that I referenced in my testimony that related to some of those concerns as they tied into the horizontal transmission.

Q Did you testify about evolutionary events?

A Yes.

Q How about mosquitoes breeding?

A Yes.

Q How about population replacement?

A Yes.

MS. STEED: Objection. This is leading.

THE WITNESS: Overruled. Go ahead.

BY MR. VANDEVEER:

Q And what were your concerns about the evolutionary events with the project that you testified about?

A Well, so this is in my testimony, but it connects the different issues here, and so it has to do with if the population of the mosquitoes are replaced with this lab strain infected population, we don't know

how much more capable they may be of spreading diseases, including those two specific ones, but others that these culex quinquefasciacitus mosquitoes transmit to humans and birds and other wildlife.

Q Did you testify about wind drift?

A Yes.

Q And what about wind drift concerned you?

A You know, I'm more concerned that no studies have been done and that this -- because this is a biopesticide, which is essentially a microbial pesticide, there's the same issue as there is with pesticides -- is that it can drift on the wind to unintended places, so how that might affect the environment and human health and, you know, just the health of life on the island as a whole.

I also had come to understand that there are issues with, you know, the efficacy of the wind drift affecting the (inaudible) as well, but my concern actually was more about these mosquitoes are going to go places they weren't supposed to go, so that's not really a controlled, contained situation.

Q When you say it wasn't studied, are you referencing in the environmental assessment for this project?

A It was not mentioned at all in the

environmental assessment.

Q From what you learned about the -- well, let me back up.

Have you read the draft environmental assessment for this project?

A Yes.

Q Have you read the final environmental assessment for this project?

A Yes.

Q And from what you learned about the project, are you concerned about any potential negative impacts?

A I'm very concerned about those impacts and several others that were mentioned in my testimonies and comments, and that were not addressed in those environmental assessments, the draft or the final -- or were not adequately addressed. Some of them were not addressed at all, several of them.

Q Can you recall what the ones that weren't addressed at all were?

A I have to think about that. I -- my comment on the draft environmental assessment is eight pages long and there are so many things in there -- yeah, I think specifically some of the studies that were referenced. I think the --

There's an issue about the female mosquitoes

that are accidentally going to be released, and that is not an if, that is something that the agencies have admitted will happen, and that there are no documented figures for that in their environmental assessment, either the draft or the final.

And the EPA guidelines allow for one female for every 250,000 males, which could amount to over 3,000 females released every week on Maui based on those EPA guidelines for this biopesticide that went through a process of emergency exemption approval through the EPA, so that's what we know can happen, is allowed to happen. I would say that's a main one that was not addressed.

It is mentioned in the final environmental assessment as if something -- if females were released -- this is in the Appendix H -- when they do address some of the public's comments, and they basically brush it off and say, "If the population is replaced, no big deal." You know, whether it's just, you know, another mosquito, they don't -- they don't consider these other factors that we're talking about that we don't know how that Wolbachia might affect that mosquito or, you know, how many mosquitoes we're going to have, might we have more than less. There's a lot of things that could happen.

Q From what you learned about the project, are

you concerned that any of the potential effects could be irreversible?

A Definitely. I feel like it's already irreversible because the Wolbachia itself is a living organism that lives on. It's not the same as a mosquito that just has a life span. It can live on in the environment and continue to propagate and find new hosts, and so it's already irreversible because they started releasing them despite our --

MS. STEED: Objection.

JUDGE TONAKI: Overruled.

BY MR. VANDEVEER:

Q You can continue.

A Well, that's my main concern. I mean it's my understanding that they -- they're doing -- probably doing the initial studies where less mosquitoes are being released right now, but it's still irreversible. That bacteria's in the environment and we don't know --

That is a foreign bacteria, and that's another thing that's been misrepresented, so when we talk about things that were not in the environmental assessment, in my research looking at the documents for this project through the EPA applications, different import permits from the agencies, it showed that the public wasn't being shown very specific information, and that can have

to do with the Wolbachia itself, which the EPA emergency exemption application shows that Wolbachia for this project originates from Kuala Lumper in Malaysia. That is foreign --

MS. STEED: Objection.

JUDGE TONAKI: Overruled.

Mr. Vandeveer, go ahead. I'm going to ask you to ask questions.

MR. VANDEVEER: Yes, your Honor.

JUDGE TONAKI: No narratives here.

BY MR. VANDEVEER:

Q Did you share any of the information you learned from what you had read with anyone?

A I shared it with the public from early on last year. I started an e-mailing list that has grown, and I've been sharing it with the public, writing articles, sharing it with media, sharing it through this testimony and public comments, and going to the outreach meetings and publicly asking these questions and presenting this information.

Q You said you wrote an article about it as well?

A I've written several, but I initially wrote an article last year after I had spoken with Dr. Pang that described the science -- the details of the science, his

concerns that he presented to me at that time.

Q And did you share this article with the Department of Land and Natural Resources or the Board of Land and Natural Resources?

A I did. I sent it in as testimony --

(Audio from 1:32 to 1:37 not transcribed)

THE WITNESS: In that document I think it does specify that they are intending to import Wob A, Wob B and wPip4.

BY MR. VANDEVEER:

Q Did you do any other research regarding requests to determine establishment of the Southern (inaudible) mosquito?

A I did. I also did research on those strains to see if they all existed in Hawaii.

Q And what did your research bear out?

MR. FRANKEL: Objection, your Honor. Calls for hearsay. Calls for opinion. Lacks foundation.

JUDGE TONAKI: Sustained.

BY MR. VANDEVEER:

Q As a member of the public, was there any concern that you had regarding the DLNR request to import and establish?

MR. FRANKEL: Objection. Relevance.

JUDGE TONAKI: Overruled.

THE WITNESS: I became especially concerned when I did follow-up research and found that there was a University of Hawaii import request that specified that wPip4 does not exist in Hawaii.

BY MR. VANDEVEER:

Q And why did that concern you?

A Because I had already had the conversation with Dr. Pang about how the different strains are -- can bring a lot of unknown factors in, and that if there's a new strain being brought into the Islands, that we don't know how that might affect the mosquitoes, the -- you know, the wildlife, the other insects that could pick it up horizontally.

And I was very concerned that this had been misrepresented to the public by Birds Not Mosquitoes and their agency partners, because they have repeatedly said that this bacteria already exists here in Hawaii, it's all around us, and the reality is that it's coming from a Mainland lab and sourced from Kuala Lumpur and tied into this project and the importing request is this wPip4 bacteria strain that does not exist on the Islands per their own documents.

Q Did you research the State of Hawaii Department of Agriculture's Emergency Exemption Application for the use of mosquitoes?

A With the EPA? Is that the EPA application we're talking about for emergency?

Yes, I believe that we're talking about -- the Department of Agricultural is the one that applied for the EPA emergency exemption.

MR. VANDEVEER: Your Honor, at this time I'd like to show the witness Exhibit P15, Plaintiffs' Exhibit 15 to refresh her recollection.

JUDGE TONAKI: She hasn't expressed a need to have her recollection refreshed, so --

MR. VANDEVEER: I thought she asked. I'm sorry. Okay.

BY MR. VANDEVEER:

Q So this is the EPA application, exemption application --

MS. STEED: Objection.

MR. VANDEVEER: Allow me to the finish my question with respect. If that's okay, I'll finish my question.

BY MR. VANDEVEER:

Q Did you research the State of Hawaii's Department of Agriculture Emergency Exemption Application for the use of mosquito DXB males as a biopesticide in Hawaii?

A Yes.

Q When did you research that?

A Some time last year within the time of finding out about this project and within a few months after that, probably a couple, three months after that.

Q And is that exemption application -- does it pertain to this project?

A Yes.

Q Did you have any concerns about that application?

A I had a lot of concerns about that application. One of them had to do with -- that's where it specifically mentioned that the bacterial strain was originating from Koala Lumpur in Malaysia and the mosquitoes originating from Palmyra Atoll.

There was also that figure of one female per 250,000 males documented in that document. It showed that the largest project area to date documented in that -- in that particular document was 724 acres whereas the one here on Maui is 64,666 acres. That seemed like an enormous jump to me.

I believe there were a few other things that I can't recollect right now, but those were three main concerns that I had.

MR. FRANKEL: Your Honor, can I ask that you instruct the witness just to answer the question because

that was not the question. I move to strike. Just ask --

JUDGE TONAKI: Overruled.

MR. VANDEVEER: Your Honor, may I show the witness P15 to refresh her recollection as to this report that we're discussing?

MS. STEED: Your Honor, the witness again hasn't expressed a need for her memory to be refreshed.

JUDGE TONAKI: Well, it's an improper use to refresh recollection, Mr. Vandeveer. If you're trying to lay foundation for this -- this document, then yeah, you can show her and ask her foundational questions, but --

MR. VANDEVEER: Okay. If that's --

JUDGE TONAKI: -- she's been testifying about the document and hasn't expressed a need to have her recollection refreshed.

MR. VANDEVEER: Understood, your Honor. If I may --

JUDGE TONAKI: Yes.

MR. VANDEVEER: -- lay a foundation?

Thank you.

THE WITNESS: I just thought of something else that if I'm --

JUDGE TONAKI: You gotta wait for a question.

THE WITNESS: Oh, okay.

BY MR. VANDEVEER:

Q And you can take a minute to look at that if you need to.

A Yeah, I remembered what I wanted to say -- one more thing for sure, but I'll take a look.

Q Is that the document -- is the document before you the emergency exemption application that you were discussing?

A Yes.

MS. STEED: Leading.

JUDGE TONAKI: Overruled.

BY MR. VANDEVEER:

Q Are you familiar with this document?

A Yes, I am.

Q Did you read it in its entirety?

A I did read it in its entirety.

Q And who's the author of the document?

A This comes from the Department of Agriculture State of Hawaii, and it is in conjunction with Verily Life Sciences, one of the mosquito labs for this project.

Q And did you rely on this application for your testimony?

A Testimony to the Board of Land and Natural

Resources?

Q Yes.

A Yes.

MR. VANDEVEER: I'd ask, your Honor, if we can admit Plaintiffs' Exhibit P15 under the Public Record Rule to the hearsay exception.

MR. FRANKEL: Objection. Lacks foundation.

JUDGE TONAKI: Over the objection of Defense, P15 will be received in evidence.

(Plaintiffs' Exhibit 15 was received into evidence)

BY MR. VANDEVEER:

Q Are there any tables or figures in this report in this emergency exemption application that concerned you?

A Yes. I'm specifically focused on Table 2, Timeline of Published Studies Demonstrating Field Efficacy of Insect Incompatibility Technique Using Incompatible Wolbachia Male Releases In Mosquitoes.

JUDGE TONAKI: What page is she referring to, Mr. --

THE WITNESS: It says 18 of 43 at the top.

MR. VANDEVEER: I'm trying to broadcast this again if I may, your Honor.

JUDGE TONAKI: Yes.

MR. VANDEVEER: I'm hoping for better luck this time.

BY MR. VANDEVEER:

Q Okay. So on this Table 2, Ms. Lia, do you see a mosquitoes species plan for use in the project anywhere in this table?

A I do not.

Q You don't see any mosquito species in this table?

MS. STEED: Objection. Asked and answered.

THE WITNESS: Actually, there -- the three mosquito species that are planned for import in connection with this project do include Aedes egypti, but in regards to the culex quinquefasciacitus that is planned for use in this avian malaria project, no, that is not on this chart of published studies demonstrating field efficacy of Insect Incompatibility Technique using Wolbachia.

BY MR. VANDEVEER:

Q So does this information comport with what you -- you understood the BNM was -- the Birds Not Mosquitoes project was saying publicly?

A Not at all.

Q Did it comport with anything that you were reading that they had put out?

A It did not. It actually was counter to the narrative that they presented to the public.

Q Can you explain -- can you explain, did this concern -- did this concern you?

A Yes, very much.

Q Why was that?

A One, because again it appeared that this project was experimental and had never been done before using this culex quinquefasciacitus mosquito and, two, because the information had been misrepresented to the public -- and I will put it nicely as misrepresented to the public.

Q Looking at this same Table 2, what do you see is the largest project area that's documented to date?

A 724 acres.

Q And what project is that for?

A That's in Fresno, California. And through my research I found it to be called the Fresno Debug or Debug Fresno Program.

Q What's the species of mosquito that's listed there for the Fresno project?

A It is the Aedes aegypti.

Q Did you see an EPA expected accidental release rate for females lab-infected mosquitoes in this application?

A Yes, I did.

Q And what was the EPA's expected female release rate?

A One female for every 250,000 males.

Q Was this information concerning to you?

A Very concerning.

Q Why?

A Because I knew that the project area was 64,666 acres and that they would be releasing up to 6,000 mosquitoes per acre up to twice per week, which meant 775,992,000 mosquitoes released weekly, and with that one female for every 250,000 males, that meant over 3,000 females were allowed to be released weekly on Maui for the next 20 years and possibly beyond, based on further documents that I found.

Q And why is that concerning to you?

A Because females bite and breed and spread disease, and because it was misrepresented again to the public that only males would be released. Repeatedly that has been said.

Q Did you research any other websites -- I'm sorry. Did you research any other authorities to confirm the information?

A I went directly to the EPA website to see if there was any updated information and, indeed, it said

on their website one female for every 250,000 males was the expected release rate -- accidental release of females with Wolbachia IIT mosquitoes.

MR. VANDEVEER: Your Honor, I'd like to show the witnesses P16 to lay foundation to admit into evidence. P16.

May I approach?

JUDGE TONAKI: Yes.

BY MR. VANDEVEER:

Q Do you recognize this document?

A Yes, I do.

Q What do you recognize it as?

A This is from the EPA website in reference to emerging mosquito control technologies with a specific section about the Wolbachia mosquitoes.

Q And is it clear to you from this website who the author was?

A I don't know that a name is put to -- usually the federal documents, it generally comes as authored from the agency, so I would say the Environmental Protection Agency is the author of this document.

Q And you said you went to the website. Do you recall what date you went to the website?

A Well, it would have to have been after October 28th, 2022.

Q And why is that?

A That's the date on the Department of Agriculture Emergency Exemption Application to the EPA, and that's what led me to go to the EPA website.

Q And is there a date listed there on the website?

A There was a date -- because I had referenced this on my website. Our organization, Hawaii Unites, compiles all of these documents and I did put a date at the time to show when this was most recently updated. And at this point now it says last updated July 11th, 2023. I think previously I would have had a date closer to the time that I looked at it, but the information is the same.

Q So on review of that document, the information is the same as you would have seen it at the time you researched?

A Yes, it's the same information for that section. There's -- there's other mosquito technologies referenced and I can't say whether those have changed, but that section with the one female for every 250,000 males is the same.

Q And that informed your research that you had done pertaining to the EPA Emergency Exemption Application; Is that correct?

A Yes.

MR. VANDEVEER: Your Honor, I'd like to admit Exhibit P15 as a public record exception to the hearsay rule.

JUDGE TONAKI: Mr. Frankel?

MR. FRANKEL: Objection, your Honor. Lacks foundation. Lacks authenticity. Lacks relevance.

(inaudible whispering)

MR. VANDEVEER: I'm sorry. It's P -- I'm so sorry, P16, that's correct.

JUDGE TONAKI: Over the objection of Defendant, P16 will be received into evidence; however, the copy -- I don't know if it's missing a page, but under the -- there's a heading, "Will this technology adversely affect human health and the environment?" And the last line -- see that page?

MR. VANDEVEER: Yes.

JUDGE TONAKI: The last line says, "The expected accidental release rate of one Wolbachia infected female for" -- and then the next page, "will cause" --

(Inaudible whispering)

JUDGE TONAKI: -- "unreasonable -- adversely effects humans or the environment," so I don't know if there's a missing page.

MS. STEED: Your Honor, respectfully we would reassert our objection as to offer -- offer misstates (inaudible) information.

MR. VANDEVEER: I'm sorry, your Honor. I'll withdraw this document for now.

JUDGE TONAKI: Okay. Yeah.

MS. STEED: Thank you.

JUDGE TONAKI: Okay. So P16 is withdrawn.

BY MR. VANDEVEER:

Q Did you submit any comment to the EPA for the State of Hawaii Department of Agriculture's Emergency Exemption Application?

A Yes, I did.

Q Do you recall when you submitted the comment?

A I believe those comments were due in January of this year, so it would have been in January, some time before the 24th, I think, was the date for that.

Q Do you recall if you received any response to that?

A I received some kind of a confirmation that my comment had been received, but a response, no. But actually in -- when this EPA exemption was approved, they did address the comments, so indirectly I guess there was some response.

Q Do you recall what the response was?

A I don't at this time, but I do have those documents where comments are addressed. I think it probably said something similar to what it says here, which there are a couple of lines missing. I don't know what happened here, but between the two pages where it says, "Likely not to have significant effect on humans."

Q You mentioned earlier that you had read the draft environmental assessment for Maui, correct?

A Yes.

Q The entire draft?

A Yes.

Q Did you see any information about the rate of release of accidental -- I'm sorry, the rate of accidental release of lab-infected female mosquitoes?

A No.

Q Did you see it in the final environmental assessment?

A No.

MR. VANDEVEER: I'd like to enter into evidence -- well, it's already been entered into evidence, your Honor, stipulated Plaintiffs' Exhibit 1, the final environmental impact assessment.

JUDGE TONAKI: Okay.

MR. VANDEVEER: May I approach, your Honor?

JUDGE TONAKI: Yes.

BY MR. VANDEVEER:

Q Just to be clear, we're speaking about -- the questions I'll be asking about the final environmental impact statement that's before you, Plaintiffs' Exhibit Number 1.

A Yes.

Q Upon reading the final environmental impact -- I'm sorry, final environmental assessment, were you able to ascertain the number of male mosquitoes that would be allowed to be released on Maui?

A No.

Q Were you able to calculate the number?

A Based on the environmental assessment, no.

Q Were you able to use the information available to come up with any sort of approximation of the amount of male mosquitoes that would be released?

A By cross referencing their own document here applying for the emergency exemption through the EPA and then again the EPA website, I was able to calculate that over 3,000 females would be allowed to be released on Maui weekly.

Q But again, that number was your calculation based on information, not a total number that was provided in the EA?

A Yes, that's a calculation based on the numbers

provided in the EA for the project area and for the maximum number of mosquitoes to be released per week and how many times per week, and then using the reference of the one in 250,000 to make that calculation myself.

Q And what was the number you came up with for the number of male mosquitoes that would be released in Maui every week?

A 775,992,000 is the high end of what could be released.

Q And what is that based upon?

A That's based upon the 64,666-acre East Maui project area, up to 6,000 mosquitoes released per acre per week up to twice a week.

Q And just to be clear, the total number you came up with is not provided -- the number you just gave is not provided in the EA?

A The 775 million --

Q Correct.

A -- 992,000? No that was not provided as a figure in the EA, no.

Q And you mentioned that you had calculated the number of accidentally released female mosquitoes based upon the emergency application we discussed earlier as well as the EPA website.

What was the number that you came up with for

the project on Maui?

MS. STEED: Objection. Asked and answered.

JUDGE TONAKI: Overruled.

THE WITNESS: It was over 3,000 and for sure it was over 3,100. I'm not positive if it was 3,104, but that feels like what the number may have been, but over 3100 for sure.

BY MR. VANDEVEER:

Q Why is that important?

A Because the females bite and they breed and they spread disease, and because it was misrepresented to the public that only males would be released.

Q Did reading the draft environmental assessment make you feel better about the project?

A The draft environmental assessment, as opposed to the final? No, it made me feel a lot worse about the project, actually.

Q Did the final environmental assessment change your opinion of it?

A Not at all. Actually, again, it made me feel worse that they were not addressing these concerns seriously.

Q Was there anything in the final environmental assessment that made you worry about birds in particular?

A In the final environmental assessment, there are specific things in there talking about the drones and the helicopters, and how they might affect the birds, and that had a lot to do with noise disturbances. There's a chart in there showing that up to 134 drone flights are going to happen per week across that conservation area and the project area as a whole. And they also mentioned that the drones could affect the nesting and roosting of the birds, and the -- I'm trying to think what they called it with the Hawaiian hoary bats -- we're just talking about the birds right now.

The helicopter rotor wash, which is the wind coming down from the helicopter propellers, could affect the birds. It talked about something along the lines of the stress of the noise disturbances with those drones and helicopters, and it also specifically mentioned that it was possible that a drone could hit a flock of birds.

Q And from your reading of the final environmental assessment, were you able to ascertain how long this project would continue?

A Yes, there's a specific line in there where it says likely at least 20 years.

Q And where is that in the final environmental assessment?

A I'll have to think about that. It's in

relation to something specific that I was looking at frequently.

Oh, it has to do with the mosquito -- the packaging for the mosquitoes. They're going to be released in packages, and it was talking about how long, you know, that effect would be happening. I believe it has to do with the packages that would be littering the forest for at least 20 years.

Q So did you have any concerns about the broader environment besides the birds?

A Yeah, I had concerns about not just the mosquitoes and the bacteria, but just the impact of this project with all of these drones and human activity and helicopters and packaging that, you know, is allegedly biodegradable, but they have no information on how long that takes to degrade, and at 134 drone flights a week with -- we don't know how many packages, but at least that many constantly overlapping, there's going to be a constant littering to the forest and --

MS. STEED: Objection. Facts not in evidence as to how frequently the packages are actually going to be released.

JUDGE TONAKI: Sustained.

MS. STEED: Thank you.

BY MR. VANDEVEER:

Q Did you submit a comment on behalf of Hawaii Unites for the draft environmental assessment?

A Yes, I did.

Q And do you recall when you submitted that comment?

A I want to say that was in January as well.

Q And did you state the concerns that we've talked about here today in that comment?

A Yes.

Q Were there any additional concerns that you shared?

A Yes, I shared several pages worth. I think it was an eight-page comment, single-spaced.

Q Do you recall what some of the other concerns were?

A All of the concerns that we've talked about here in my testimony today and additional other concerns, some having to do with things that were discussed specifically in the environmental assessment itself, like wildland fires and effects on the native plants and on the character of the wilderness.

There were a number of things in their chart within the draft environmental assessment that I was also concerned about.

And I also brought up concerns about Native Hawaiian environmental justice because I felt that this project hadn't really taken into account the perspective of that community, and the fact that there would be potential implications to their health since they are living up against the project area, a lot of native Hawaiians. And they hunt, you know, they use the resources there for feeding their families and I was concerned about that.

Q Did your comment on the draft environmental assessment include a request that an environmental impact statement be completed for the project?

A Yes, it did.

Q Did you submit written testimony for the Board of Land and Natural Resources' meeting that took place on March 10th of this year?

A Yes, I did.

Q Did you also submit oral testimony via Zoom for that meeting?

A Yes, I did.

Q Did you state some of these same concerns that you've discussed today from your environmental -- I'm sorry, from your comments on the draft EA in that meeting?

A Yes.

Q Including the need for an environmental impact statement?

A Yes.

Q Were your concerns addressed at that meeting?

A No, they were not.

Q Were the concerns documented in your comment adequately addressed in the final environmental assessment?

MR. FRANKEL: Objection. Calls for legal conclusion.

JUDGE TONAKI: Overruled.

THE WITNESS: No, they were not.

BY MR. VANDEVEER:

Q Looking at Appendix X of that document, Exhibit P1, I'll try to pull it up here as well.

A Did you say Appendix X?

Q Yes, it would be the very end of the document.

A I didn't think it went that far, but okay. What is the title of that appendix?

Q Responses to Substantive Public Comments.

A Okay. I think that's Appendix H, actually.

Q I'm sorry. Did I -- I'm sorry. That's what I meant, Exhibit H, not X. Okay.

JUDGE TONAKI: What page?

MR. VANDEVEER: It's going to go from pages --

THE WITNESS: I got it. I found it.

BY MR. VANDEVEER:

Q And this is the PDF page 260 to 276, and it's up on the screen now.

Yeah, I'm not going to touch it.

Okay. Ms. Lia, can you tell -- can you tell where your comment was responded to in this section Appendix X, Responses To Substantive Comments On Environmental Assessment?

MS. STEED: Objection, Appendix H.

BY MR. VANDEVEER:

Q I'm so sorry, Appendix H.

A Oh, I can't really tell because they appear to have mixed comments together and summarized them, and nothing is identified here, so no.

Q Was the full text of your comment or any full text of your comment included in Appendix H?

A No.

Q Was your name included as a commenter under the topic heading of any of the issues you raised in Appendix H?

A No, it was not.

Q Did you feel that you -- that your comments clearly received a substantive response in this final environmental assessment?

A No, I did not.

Q And how did that make you feel?

A I felt that the public participation process was not being honored, and I felt that our concerns were not being taken seriously, and I felt very much that this decision to do this project had been pre-decided and that they were working the documents around that decision that had already been made, and I felt there hadn't been enough study.

Q Okay, is it okay -- Judge, can we take a brief recess? Is that okay?

JUDGE TONAKI: Yes, take a ten-minute recess.

MR. VANDEVEER: Thank you.

THE BAILIFF: All rise. The Court is in recess.

(Recess was taken)

THE BAILIFF: All rise. This Court is reconvened. You may be seated.

JUDGE TONAKI: Back on the record in Hawaii Unites versus the DLNR.

Ms. Lia is still on the -- may the record reflect the presence of parties and counsel, and Ms. Lia is still on the witness stand.

Mr. Vandeveer, continue.

MR. VANDEVEER: Thank you, your Honor.

BY MR. VANDEVEER:

Q Ms. Lia, we were talking about Appendix H to the final environmental assessment plan for the Maui Wolbachia mosquito experiment.

Did you expect to see your name in the comment section, Appendix H?

A I'm not sure at the time that I expected -- I knew what to expect at all from that response process. I learned later that it should have been in there, it appears, but no, at the time I did not know what to expect.

Q Did you see the names of any of the members of Hawaii Unites in this comment section?

A No.

Q Turning to concern number 20 in this appendix, earlier you mentioned that you had commented on the mosquito packaging for the project area; is that correct?

A Yes.

Q And can you read the response here under concern number 20, just the first paragraph if you would? I'm sorry. Just a moment.

Just a moment, please.

That's right, the first paragraph if you would.

A It says, "Although the final design has not been decided upon, agency and private partners are committed to designing release packaging that is suitably biodegradable and will maintain biosecurity protocols; however, until a final product is designed, specific to K rates or other relevant variables are not known, as strict biosecurity protocols will be followed, the release packets present no risk to the environment, although many thousands of release packets would be dropped across the project area throughout the duration of the project. The small packets would be spread diffusely and the biodegradable material would decompose quickly, thus the impact to the environment would be negligible."

Q In the impact mitigation section of this document -- this is not Appendix H any more -- do you -- from your reading of this document, did you see any mitigation protocols for horizontal transfer?

A No. No, I did not.

Q Did you see any of the literature that you referenced earlier in your comments included in the full environmental impact assessment?

A Not the literature itself. I believe I was able to find reference to one article just in a citation, which I assume is one of the articles that I

submitted, but no, the articles themselves, no, and no actual reference to the text of the articles.

Q Did you attend -- attend any Birds Not Mosquitoes public outreach events to ask questions?

A Yes, I did.

Q And did you receive answers to your questions?

A I did receive answers to my questions, yes.

Q So they addressed your concerns?

A Not adequately, but they did make an attempt to answer the questions as best they could, being that it wasn't -- many times it wasn't the scientists representing the project, and other times we were not able to interact; it was via Zoom and questions were read and responded to, but no, I did not feel that my questions were adequately responded to at any of those meetings.

Q And do you feel like your questions were adequately responded to in this final environmental assessment?

A No, I don't.

Q At this point do you have any additional concerns since the environmental assessment came out, the final?

A Yeah, I have several concerns with additional documents that we've uncovered connected to the project

and the bigger project as a whole.

Q Can you describe those?

A One of the main concerns that I have now is that we recently have un -- I want to say uncovered but it's the public document so, you know, it was out there, but it was not presented to the public until just recently -- found out that the Department of Land and Natural Resources already has a lab that's been funded to build out the insect area to mass produce these Wolbachia mosquitoes which, to me, is another conflict of interest tied to the same agencies. You know, the agency that proposed the project, their board voted it through and it turns out they're benefiting through this lab that, it says in the document, wants to do this in perpetuity, so forever.

And it also talks about advancing into generically modified PGSIT, Precision Guided Sterile Insect Technique crisper (sic) technology with the mosquitoes, and they want to produce those in the lab as well.

There are a few other issues in that document that were of concern, but those were the main ones.

JUDGE TONAKI: I'm sorry. Ms. Lia, can you keep your voice up, please?

THE WITNESS: Louder?

JUDGE TONAKI: Yes, a little louder.

THE WITNESS: Yes.

BY MR. VANDEVEER:

Q Based on your review of the final environmental assessment, was this laboratory that you just described mentioned in that document?

A It was not mentioned in that document, no. There was reference to potentially -- if there was a lab here on the Islands, they could expedite the process of something to do with the -- it was very vaguely mentioned that if there was a lab on the Islands, but no, the Department of Land and Natural Resources lab with insectary mass-producing these mosquitoes was absolutely not mentioned in that document.

Q Ms. Lia, do you feel that this project will significantly impact the environment of your home?

A Very much. That's why I have committed hours of my life for the last year to make sure that it's done right.

MR. VANDEVEER: Thank you, your Honor. No further questions at this time.

JUDGE TONAKI: Ms. Steed, cross-exam?

MS. STEED: Yes. Thank you, your Honor. Just a few questions.

We're going to project exhibits so --

MR. FRANKEL: Okay.

MS. STEED: -- yeah.

MR. VANDEVEER: And she has a copy of the -- you're talking about 1?

MS. STEED: Yeah. Yeah, Exhibit 1. I just want to pull it up for everyone in the gallery.

(inaudible whispering)

CROSS-EXAMINATION

BY MS. STEED:

Q Okay. Ms. Lia, do you still have Plaintiffs' Exhibit 1 in front of you?

A Yes.

Q Okay.

A Yeah.

Q I am on PDF page 260 where it begins with the concerns.

Do you see where I'm at?

A Yeah.

Q Okay.

A Yes.

Q Okay. And I'm looking at concern number 1.

Do you agree that concern number 1 was about whether or not an environmental impact statement should have been prepared?

A Yes.

Q Okay. Now I'm looking at -- same page, I'm looking at comment number 2.

Do you agree that comment number 2 was about the concern of potential impacts to public health and safety?

A Yes.

Q I'm now on PDF page 261. I'm looking at concern 4.

Do you agree that concern 4 addressed genetically modified organisms or bio-engineered organisms?

A Yes, but that was not one of my concerns.

Q But just to clarify, you testified earlier that that had been a concern raised in June of 2022?

A Before the Birds Not Mosquitoes agencies presented the information about the Wolbachia mosquitoes, that had been a concern in the community. There was a misperception.

Q Thank you --

A Yeah.

Q -- Ms. Lia.

Okay. Okay. I am now on page 263 looking at concern 7.

Do you agree that concern 7 was about whether

or not alternatives were adequately addressed?

A Could you repeat the question, please?

Q Do you agree that concern 7 was about whether or not alternatives were adequately addressed?

A Yes.

Q Okay. I'm now on PDF page 265 looking at concern 9.

Do you agree that concern 9 was about whether or not there had been sufficient time to study the proposed action?

A I don't believe it's worded specifically that way.

Q Do you understand it to have a different meaning?

A I would say that it specifically says there had been insufficient study of the proposed action, and then it says it would be a rash decision, which you could reference as a timeframe, but the theme of the comment appears to be about the insufficient study of the proposed action.

Q Okay. Do you agree that comment concern 9 addressed whether or not there was insufficient study of the proposed action?

A Whether the topic is addressing that as opposed to whether it has been addressed in the --

Q Whether that is the topic of concern.
A That is the topic, yes.
Q Thank you.
I'm now on PDF page 266. I'm looking at concern 10.
Would you agree that concern 10 addresses the concern raised that the Wolbachia bacteria would be a foreign introduction into the environment?
A Yes, that's what the concern --
Q Yes?
A -- topic appears to be, yes.
Q And on the same page looking at concern 11, do you agree the concern 11 addressed concerns raised that the proposed project would be an experiment?
A That is the topic, yes.
Q And now PDF page 267, I'm looking at concern 12.
Do you agree that concern 12 was addressing the concerns raised about female mosquitoes potentially being released?
A Could you repeat that question?
Q Do you agree that concern 12 was about the concerns raised over female mosquitoes potentially being released?
A The topic is about some concerns related to

female mosquitoes being released, not all concerns, but it is --

Q Do you agree that concern 12 was about concerns raised over females being released?

A I would agree that it is related to some concerns about female mosquitoes being released, some of the concerns that were expressed by commenters.

Q Okay. Do you agree on page -- PDF page 268 that concern 13 addresses concerns raised about the risk of increasing transmission of certain diseases?

A Yes, that's the topic.

Q And on PDF page 269 looking at concern 14, do you agree that concern 14 addresses the concerns raised that the Wolbachia would infect other insect species with Wolbachia via horizontal transfer?

A That is the topic, yes.

Q And on PDF page 270 looking at concern 15, do you agree that concern 15 addressed concerns raised about horizontal gene transfer from the mosquitoes being released?

A It addresses horizontal gene transfer, but in regards to any information that I would have brought concerns up, I don't think it's accurate, so I'm not sure how to answer that question.

Q My question is just, you know, in looking at

concern 15, regardless if -- if you -- regardless of whether or not it adequately addresses it, do you agree that it addresses the concern of horizontal gene transfer?

A It appears to be addressing horizontal gene transfer as a concern.

Q Okay. And looking on page -- PDF page 271 concern 16, do you agree that concern 16 is addressing the concerns raised over Native Hawaiian concerns?

A Yes, I would agree that's the topic.

Q Okay. Now I'm on page 274 looking at concern 20.

Do you agree that concern 20 is about the environmental effects of dropping mosquito packaging in the project area?

A Yes, that's the topic.

Q Okay. And going back up to PDF page 273, looking at concern 17, do you agree that concern 17 is about concerns that there was additional literature to be reviewed?

A Could you state that again?

Q Sure. Would you agree that concern 17 is about whether or not additional literature was reviewed by the agency?

A I would say that appears to be the topic, yes.

Q Okay. And on that same page looking at concern 18, do you agree that concern 18 addresses the concerns raised over wildland fires potentially ignited by drones and helicopters?

A That is the topic yes.

Q And looking on PDF page 275 at concern 23, do you agree that that concern addresses -- that that -- that addresses the concern raised that there would be an adverse impact under the no action alternative to visitors at the wilderness?

A That appears to be the topic.

Q Okay.

A I'm not familiar with this.

Q I'll withdraw --

A This is -- yeah, I'm not --

Q Okay. That's fine. I'll withdraw the question.

A Okay.

Q PDF page 275, looking at concern 24, do you agree that it addresses the concern that there could be unanticipated outcomes and that a monitoring and response plan will be implemented?

A It doesn't address those concerns because there is no plan, but that appears to be the topic.

Q Would you agree that that's the topic of

concern in --

A That is the topic, yes.

Q Okay. Now, Ms. Lia, previously in your testimony, is it correct that you testified that you recreate in the Makawao Forest Reserve area; is that correct?

A Yes.

Q Now, when you're recreating in the Makawao Forest area, have you ever seen honeycreepers?

A I think I have in the past. I'm not a bird expert so I don't know that I would know specifically if it was a honeycreeper or some type of finch maybe, but I think I likely have.

Q Do you -- so you wouldn't know the identity though?

A At this point, I might. I might. But, you know, in the past, I can't say I would have known specifically if it was a honeycreeper.

Q Do you have a favorite honeycreeper?

A I'm going to say the i'iwi is the one that I -- actually I do think I have seen the i'iwi in Hosmer's Grove previously, so that probably would be a favorite, based on the fact that that's one I'm familiar with.

Q And why is the i'iwi your favorite

honeycreeper?

A Why is that my favorite honeycreeper?

Q Well, that was the question I asked.

A I mean, I don't know that I have a favorite. I'm not a bird-watcher, so I just like -- appreciate wildlife and love animals and birds, and I don't necessarily have a favorite honeycreeper, but if -- you know, if you were to say, "You have to pick a favorite," it would be one that I had seen before and that I recognized readily.

Q Would it --

A So yes.

Q -- be fair to say that in general you have an appreciation for honeycreepers?

A Yes.

Q How would you feel if the honeycreeper went extinct?

A I would be sad if the honeycreeper went extinct. I would, of course, be sad. They're endangered and they're beautiful and they're connected to the culture and ancestry of the Islands.

MS. STEED: All right. Thank you.

No further questions from the State subject to recall. I do think that my co-Defendants have a couple cross.

JUDGE TONAKI: Okay.

MR. FRANKEL: Thank you.

CROSS-EXAMINATION

BY MR. FRANKEL:

Q You testified earlier that you found out about this project from your network that keeps you informed --

A Yes.

Q -- Ms. Lia?

Is that network -- is that network concerned about the Covid vaccine?

A They're concerned about a lot of different issues, including, you know, our freedoms and our health freedoms and -- yeah.

Q So concerned about the Covid vaccine?

A I would say that's a topic of concern for that particular network, yeah.

Q And Bill Gates?

A I would say that's a topic of concern for that network, yes.

Q And George Soares?

A Yes.

Q Okay.

A A topic of concern.

Q And you're opposed to this project, right?
A I am opposed to this project as it's been presented, yes.
Q And you'd be opposed regardless of what an environmental impact statement would say?
A I don't know because we don't have an environmental impact statement so I can't answer that. You know, how would I know what would be presented in that document?
Q So there could be an EIS that had information and you would support this project?
MR. VANDEVEER: Objection, your Honor. Calls for speculation.
JUDGE TONAKI: Overruled.
THE WITNESS: I don't know how to answer that without seeing the EIS.
BY MR. FRANKEL:
Q All right. You're not trained as a biologist, are you?
A No, I'm not.
MR. FRANKEL: Okay. No further questions, Thank you, your Honor.
JUDGE TONAKI: Thank you.
Any redirect, Mr. Vandeveer?
MR. VANDEVEER: Yes, your Honor.

REDIRECT EXAMINATION

BY MR. VANDEVEER:

Q Ms. Lia, earlier when Attorney Steed was talking about Exhibit Number 1, the final environmental assessment, whereas you would agree that the comments were topics that were identified by Attorney Steed, do you mean to agree that you felt the concerns raised were clearly addressed?

A Could you repeat that? Attorney -- what are we --

Q You agreed that the comments that she took you through were topics that were identified.

Did you mean to agree that you also felt that the concerns that were raised were clearly addressed?

A No. I was just confirming that those appeared to be the topics that were discussed in the Appendix H under those numbers.

Q And when you submitted comments on the draft environmental assessment, did you expect those comments to be addressed in the final environmental assessment, or did you expect a state attorney to sift through them with you later?

A I had hoped that they would be addressed in the final environmental assessment.

MR. VANDEVEER: Thank you, your Honor. No

further questions.

JUDGE TONAKI: Ms. Steed, any other questions?

MS. STEED: Nothing from the State.

JUDGE TONAKI: Mr. Frankel?

MR. FRANKEL: No.

JUDGE TONAKI: Okay. Thank you, Ms. Lia. You're excused as a witness.

(The witness was excused)

JUDGE TONAKI: Ms. Steed, do you need a brief --

MS. STEED: Yes.

JUDGE TONAKI: Oh, I'm sorry, Mr. Vandeveer.

MR. VANDEVEER: I was just going to say no further witnesses for the Plaintiff, your Honor.

JUDGE TONAKI: Plaintiff rests.

Ms. Steed, do you need a --

MS. STEED: Yes. If we could take a brief recess?

JUDGE TONAKI: The Court will take a ten-minute recess.

MS. STEED: Thank you.

JUDGE TONAKI: The Court will stand in recess.

THE BAILIFF: All rise. The Court stands in recess.

(Recess was taken)

THE BAILIFF: You may be seated.

JUDGE TONAKI: We're back on the record in Hawaii Unites versus DLNR.

The record will reflect the presence of the parties, counsel.

And Ms. Steed, your first witness?

MS. STEED: Yes. Thank you, your Honor.

The State would like to call Nicole Ferguson to the stand as our first witness.

JUDGE TONAKI: Okay.

We'll administer the oath, if you could stand?

THE CLERK: Do you solemnly swear or affirm that the testimony you're now about to give shall be the truth, the whole truth and nothing but the truth?

THE WITNESS: I do.

THE CLERK: Thank you.

JUDGE TONAKI: Ms. Ferguson, if you could speak clearly and loudly into the microphone?

THE WITNESS: How's that?

JUDGE TONAKI: Ms. Steed?

MS. STEED: Thank you.

NICOLE FERGUSON,

having first been duly sworn, was

examined and testified as follows:

DIRECT EXAMINATION

BY MS. STEED:

Q All right. Good afternoon, Ms. Ferguson. Thank you for being with us here today.

I'd like to start by asking you to state your name for the record.

A Hi. Yes, my name is Nicole Ferguson.

Q Oh, and just a quick little warning with the microphone, if you get a little bit too close, there's feedback so you have to find the exact right spot.

A Okay. Thank you.

Q Okay. And are you employed?

A Yes.

Q Where are you employed?

A I'm currently with the Maui Forest Bird Recovery Project.

Q What is your position there?

A I'm the field supervisor for the Mosquito Control and Research position.

Q And how long have you been in that position?

A I started there in March of this year.

Q And prior to working at Maui Forest Bird Recovery, where did you work?

A I worked for the Department of Health.

Q And how long did you work at the Department of

Health?

A I worked for the Department of Health for five months.

Q And what was your position there?

A My position there was entomologist.

Q And prior to working at the Department of Health, where did you work?

A Prior to Department of Health, I was -- right before that, I was with Hike Maui.

Q And what did you do at Hike Maui?

A I was a nature guide.

Q And prior to that, where did you work?

A Prior to that, I worked for Mauna Kahalawai Watershed Partnership.

Q And what was your role there?

A So the role there encompassed a lot of different activities, but it was focused on field conservation and biology in the West Maui Mountains, also known as Mauna Kahalawai. That work included things like insect releases for bio control.

Q And did you have another job before that?

A Yes. I've had several other jobs before that, including working for the University of Hawaii.

Q And what did you do for the University of Hawaii?

A So I've done several roles with the University of Hawaii, including teaching in the University of Hawaii system for five years. During that time, I taught courses including zoology and including microbiology. During my time with the University of Hawaii system, I also led student research on insects, so I was a faculty mentor during that time also.

Q And while you were with the University of Hawaii system, did you work in any labs?

A Yes. So I worked for the University of Hawaii, as I mentioned, in various capacities, including working in labs, including at Honolulu Community College.

Q And what did you -- what was the topic of the labs you worked in?

A So while at Honolulu Community College, I supervised student research. Some of that research was on termites and on termite control.

Q And what is your educational background?

A I have one Bachelor's degree from the University of Arizona that is in Ecology and Evolutionary Biology. I also have a Master's in Ecology and Evolutionary Biology from the University of Arizona during that time focusing on insects and entomology. And then I also have a Master's in Zoology from the

University of Hawaii at Manoa.

Q And going back to your current position with Maui Forest Bird Recovery, what do you do in your current position?

A I do a lot of different tasks. As the field supervisor, I lead a crew of seven, so I'm in charge of day-to-day operations, also in charge of looking at data that we receive, summarizing data, analyzing that data, making decisions based on that data. I also do a wide variety of entomological tasks, including mosquito identification, including looking at mosquito longevity, doing things like looking at mosquito health and movement, also things like deciding which microscopes we have, teaching mosquito identification and sex sorting to our field crew and to other members of Maui Forest Bird Recovery Project. I also am a member of the Birds Not Mosquito meeting groups, which has continued since my time at Department of Health, and also just doing the field releases themselves. So when we do marked release or capture studies, I'm on the ground making sure that happens to plan.

Q Could you please explain what marked release recapture study is?

A Absolutely. So the point of an MRR study, essentially, is to understand the movement of mosquitoes

in different environments. So in our case we're looking at the movement of mosquitoes within forest environments and so what takes place is we release a known number of mosquitoes at a set release point. We then see how far the mosquitoes travel in that forest.

One of the ways of doing that is establishing a trapping network, so, if you will, like a grid of traps. You know where you've released the mosquitoes, you know where you're catching the mosquitoes, and you can, therefore, establish things like average distance traveled, maximum distance traveled, et cetera.

Q And do you do research on Incompatible Insect Technique?

A I currently do research in the sense that we are deploying mosquitoes that have Wolbachia. We also do things like longevity assays, so in that sense I'm involved. Because these mosquitoes have Wolbachia, I'm currently not doing any, like, transections or anything at that level, but I am working with IIT mosquitoes at this time.

MS. STEED: Your Honor, the State would like to qualify this witness as an expert as to the on-the-ground operations of the project addressed in the EA as well as to how Wolbachia mosquitoes interact in the environment.

JUDGE TONAKI: Mr. Vandeveer?

MR. VANDEVEER: No objection, your Honor.

JUDGE TONAKI: Ms. Ferguson will be qualified as an expert in on-the-ground operations of the mosquito project and how Wolbachia -- what was the other?

MS. STEED: And how the Wolbachia-affected mosquitoes interact in the environment.

JUDGE TONAKI: Any objection?

MR. VANDEVEER: Yes, your Honor, no objection as long as it's limited to those two things.

JUDGE TONAKI: Okay. Thank you.

Ms. Steed, continue.

BY MS. STEED:

Q Ms. Ferguson, could you explain what Incompatible Insect Technique is?

A The short answer or long answer?

Q Start with the short answer.

A Okay. So incompatible -- Incompatible Insect Technique is based on the fact that Wolbachia is a reproductive manipulator. So Wolbachia is a bacteria that is inside many insects, and it seems to not actually be a pathogen. Its role inside insects is actually to affect reproduction.

So what we know from culex mosquitoes is that the Wolbachia inside a male has to match the Wolbachia

inside a female in order for them to successfully reproduce, so based on that knowledge, we can use that incompatibility to further different goals.

In this case, the incompatibility is used to make sure that we're reducing the population of mosquitoes. So if we have a Wolbachia male -- a male with Wolbachia and a female with Wolbachia and their two types do not match, they will mate, the female will lay eggs but those eggs do not typically hatch. So because the eggs do not hatch, you see a reduction in the population. So it's using this mismatch between the Wolbachia types in order to reduce the mosquito population.

Q Is Wolbachia already present on Maui?

A Yes.

Q Is it already present in the culex quinquefasciacitus mosquito?

A Yes. So Wolbachia is present in both culex quinquefasciacitus and Aedes albopictus, which are the two most numerous mosquitoes on Maui.

So from my time with the Department of Health Vector Control Branch, I did work with both culex and Aedes, and we found that those were the two most common mosquitoes on Maui. And those are both -- it is known that they both carry Wolbachia, and it is thought that

they are essentially universally infected with Wolbachia.

Q And when you talk about types of Wolbachia, could you explain what you mean by a type of Wolbachia?

A Yes. So Wolbachia, like all living organisms, shows genetic diversity. You can look at different super groups of Wolbachia, which is the very broad category. If you go more fine detailed than super group, you're looking at a strain. And if you go even further in even more detail, you're looking at isolettes.

Q Okay. So when you're talking about having a male mosquito with one type of Wolbachia and a female mosquito with another type of Wolbachia, are you -- of the different substance of Wolbachia you just described, which one are you talking about?

A So in the case of the culex Incompatible Insect Technique Project, it's looking at swapping out the strain, so it's taking culex mosquitoes that already have Wolbachia and swapping out which strain they carry to then make them incompatible with the wild females that are already present on Maui.

Q And how do you swap out the strain in the male mosquitoes?

A So the way that that process takes place is

that they will basically cure the mosquitoes of that infection using antibiotics. Once the infection has -- the native natural-occurring infection has been cured, they then inject the desired Wolbachia into the eggs and then create a new lab strain from that. And then we now know that that lab strain now no longer matches the wild type or the type that's commonly found in the wild.

Q But does that strain have to be injected into the eggs?

A My understanding is that other types -- other procedures for trying to establish these infections were not successful, and so I am aware that University of Hawaii scientists tried establishing infections with this Wolbachia type for many years unsuccessfully and that's why a Mainland company, in this case Verily, was asked to step in and help, because it turns out it's really, really hard to infect mosquitoes with Wolbachia. It was attempted for many years unsuccessfully at the University of Hawaii.

Q Now, once you have this male mosquito from the lab that's been injected with a new strain of Wolbachia, you release it -- well, under IIT, you would release it into the wild; is that correct?

A That is correct.

Q And once it's released into the wild, does it

mate with wild mosquitoes?

A Yes. So you want it to mate with wild mosquitoes. That's the entire point of the project. We do know that the female culex mosquitoes will mate only once within their lifetime, so in the case of this project, you hope that the males go out into the wild, they find these naturally-occurring females, they mate with them and that female will then lay eggs that never hatch for her entire lifetime.

We know that culex females can live up to 60 do 90 days, so two to three months, so if she successfully mates with one of the released males, in this case she would have infertile eggs for, in this case, two to three months and, therefore, she's taken out of the breeding population essentially.

Q What is the life span of the released males?

A So the released males, right now it looks like the average life span is under a week, so the males have a much shorter life span than the females, and so for an IIT project of this scale to work, you need constant releases since the males are dying within a week.

Q Now, once a male -- a lab male with a different strain of Wolbachia has mated with a wild female and the female begins laying these eggs, is it possible that any of them are going to hatch and become

a mosquito?

A So it's not impossible for that to happen, but what they've seen from these studies is that the incompatibility creates very, very low hatching rates, and so what we know is that that will then decrease the population, so it's very, very close to zero hatching rates.

Q And when you say these studies, are these studies that you're involved with?

A So I have not done any egg-hatching studies myself. That would be the job of the vendor in this case, Verily.

Q But you know that Verily has done these studies?

A Yes.

Q Okay. Now, when you have -- when you have this injected strain of Wolbachia in the male mosquitoes, is it possible for hatched strain of Wolbachia to get into other organisms?

A So the thing I'll answer to that is that this strain of Wolbachia is already very, very present on Maui, so Aedes albopictus, which I mentioned earlier, Aedes albopictus is extremely common on the island of Maui across elevations and very, very highly populated in population centers.

So we know that this strain of Wolbachia is present in Aedes albopictus across the island of Maui, so it's already there and it's already there in very, very large numbers. So Aedes albopictus has been on Maui for more than a hundred years. We know that this Wolbachia strain has been there essentially that entire time.

Q And is there any chance that the strain of -- strike that.

When a male -- when a mosquito already has a strain of Wolbachia, does it pass that strain onto its offspring -- offspring?

A So Wolbachia is, generally speaking, passed from mothers to daughters, so when you see Wolbachia in a mosquito body, it preferentially likes to live in reproductive tissues, so the most likely spot within a mosquito body the Wolbachia is detected is the ovaries.

So if you have a Wolbachia-infected female, you will generally find Wolbachia in her ovaries. When she creates eggs, the Wolbachia is then transferred to those eggs and, therefore, it moves from mother to offspring, so that is the typical pattern that we see in Wolbachia transmission is from parent to offspring from the mothers, not from the fathers.

Q And is it possible for a mosquito that has one

strain of Wolbachia to become infected with another strain of Wolbachia if it shares the same feeding area?

A So it's extremely unlikely that shared feeding areas would lead to Wolbachia transmission. As I alluded to previously, when they did injections of Wolbachia into other mosquitoes, it wasn't working.

We know that additionally the females are taking blood meals. The males are drinking nectar and that's how they get their sugars. The odds that it would be transmitted -- in this case what you're describing is horizontally within a generation. I have not seen any papers that credibly make it -- make a good point that it would be shared that way.

Wolbachia does very, very poorly outside of insect cells, so Wolbachia -- this is a non-scientific term, but it's kind of wimpy so it doesn't do well outside of that cellular environment, so it's geared not only to be within cells, but it's really evolved to be really successful at being within insect cells.

So when they do assays to try to see can it survive in mammalian cells or bird cells, other vertebrate cells, it really likes to just be inside insect cells specifically, so we see that Wolbachia degrades very quickly within the environment. So if you put it in water or soil or a surface, it dies very

quickly.

Q Could you explain what an assay is?

A Sorry. A test or a diagnosis.

Q And once Wolbachia is no longer in a mosquito, how quickly does it die?

A So that's a very, very good question because there's some labs that will just try to detect the genetic material of that Wolbachia, and so they will -- and then some labs actually do the gold standard, which is viability, right?

So if you take a Wolbachia -- like if you take a mosquito with Wolbachia and let's say I crush it right here, you could come back in a week and you might find DNA, right? Does that mean it's viable? Probably not.

In the same way that I could go to your house and get your hair and I could detect your DNA, but it doesn't mean you're there. I hope that analogy makes a little bit of sense.

So picking up the DNA of an organism does not mean that it is still viable and that it's still alive, so, you know, from looking at some of the evidence or having discussions with Dr. Pang, he said, "Oh, it can persist in the environment for a really long time." Those papers are papers where they looked at just, "Is the genetic material found, yes or no?" as opposed to

viability of the Wolbachia cells.

Q And in terms of the Wolbachia being present in the male mosquitoes, let's say a Hawaiian honeycreeper ingested one of the lab-infected mosquitoes, what would happen to that birds?

A So in the case of ingestion, it's actually a very easy answer because gastric juices will digest that organism very quickly, so the mosquito itself, as well as the Wolbachia, would be digested and would just be reduced to proteins, enzymes, fats, et cetera.

Q And what would happen if a human being ingested Wolbachia?

A The process would be the same. So our digestion is actually very similar to that of birds, so if I were to swallow a mosquito right now, it would go from my esophagus into my stomach and the digestive juices of the stomach would break down that mosquito in the same way.

Q And let's say there was a female mosquito with the lab strain of Wolbachia, if it bit a Hawaiian honeycreeper, would it then transmit Wolbachia into that honeycreeper?

A So no, because, again, Wolbachia really is geared towards living inside of insect cells specifically, so we see that Wolbachia cannot persist in

either mammalian or, in this case, avian cells, so there is no recorded evidence in any of the literature of Wolbachia persisting in any avian model.

Let me rephrase that. There's no evidence of Wolbachia persisting in either a person's body or a bird's body.

Q Is there any chance that an IIT mosquito could harm an endangered forest bird?

A Not in any realistic scenario that I can think of. I cannot think of a way it could harm it.

Q Is there any chance that a Wolbachia-infected mosquito could harm any other type of bug?

A Could you elaborate on that question?

Q Sure. Is it possible for a Wolbachia-infected mosquito to transmit Wolbachia to another bug?

A Okay. Thank you. So we -- again, Aedes albopictus, which is currently on the island of Maui, and culex quinquefasciacitus, which is also full of Wolbachia on the island of Maui, we have no known horizontal transfer events that have taken place during that time, so culex was introduced to the island of Maui in 1826 and we've never seen it escape into any other organism. So the culex quinquefasciacitus that has been on Maui since 1826 has never been seen to pass its Wolbachia to, say, the ladybug or another mosquito or

any other insect, so there's no record of that happening in nearly 200 years.

Q Okay. So now when a lab-infected male mosquito mates with a wild female under this project, can that male mosquito transmit the lab strain of Wolbachia to the wild female?

A So in order to address that, I would, like, pull on the literature. So there is some literature on that. There was a study by Ross, et al where they looked at whether this particular strain could be transmitted through sexual reproduction. It was the same strain that we're using in this project, which is called WALB.

So they looked at males that had Wolbachia. They mated them with females that did not have Wolbachia. They tested the females for 23 days post-mating, and they found that the females were not infected with WALB or the strain of Wolbachia.

So based on the literature that we have so far that I have looked at, it does not seem to be transmitted through reproduction.

Can I add to that a little bit?

Q Do you mind if she adds?

MR. VANDEVEER: No objection.

THE WITNESS: So just to recap, Wolbachia is

typically transmitted what we call vertically through the generations, right? That's vertical transmission from parent to offspring. Horizontal would be within a generation, and we do see that Wolbachia is vertically transmitted.

BY MS. STEED:

Q Is there -- if vertical transmission were to be suppressed, would that increase horizontal transmission of Wolbachia?

A Of the Wolbachia cells.

Q And in terms of the Wolbachia being present in the male mosquitoes, let's say a Hawaiian honeycreeper ingested one of the lab-infected --

A I'm not sure what that means.

Q Well, so, for example, under this program -- well, let me back up for a second.

So under this program, you release lab-infected male mosquitoes, they mate with the wild females and, if successful, the population of wild females is reduced; is that correct?

A That is correct.

Q So could you explain the difference between vertical and horizontal transmission?

A Sure. So vertical means from parent to offspring. Horizontal means within a generation. So,

for example, horizontal transmission could be through sexual contact between two insects. It could be through something like a parasitoid wasp that's moving around from one insect to another. It could be from -- you know, when we look at hemiptera insects, so insects that feed on plants, there's been some ideas that maybe through shared plant feeding -- hemipteras are insects with piercing sucking mouth parts and they will stab the plant itself and they will suck the plant juices, so there's been conversations and writing in the literature about perhaps shared feeding with these piercing sucking mouths could move around symbionts.

Q Could you define what a symbiont is?

A Yes. So an endosymbiont is a bacteria that lives within insects and it's typically restricted to meaning bacteria that are, like, established in a way that is stable. So we're not talking about pathogens typically when we talk about endosymbionts, so disease-causing organisms that have transient infections in an insect are not considered endosymbiont.

So insects endosymbionts are very, very common and they're very, very diverse. And that is some of the work that I did for my master's at the University of Arizona.

Q Is Wolbachia an endosymbiont?

A Yes.

Q And is there a correlation between vertical transmission of Wolbachia and horizontal transmission?

A Could you clarify your question?

Q Are vertical -- is vertical transmission and horizontal transmission at all related?

A No, they're really, really different processes. So for looking at Wolbachia, because Wolbachia is a reproductive manipulator, and it really tends to segregate within the tissues to places like the ovaries -- if you have an infection that's in your ovaries, it's quite unlikely that that would pass to a neighboring insect because the ovaries are deep within the body, the ovaries are not exposed to the exterior environment, so that type of infection does not -- is not expected to be easily moved around.

Q Now, for the release of these lab-infected male mosquitoes under the project, is there a chance that female mosquitoes are also being released?

A So when we talk about that, we look up probabilities, right? So the probability is non-zero of that happening, but what we do know is that the probability of that happening is very low, and the consequence of that happening is also very low, so it's a low probability and a low consequence event.

So currently the best estimates are that the risk of releasing one of these females is approximately one in 50 million. Now, if that were to happen, that is a low consequence event because realistically for our project if females get released, that just means that the project is a little bit less successful. It means that there's a little bit less supression happening.

So in terms of if that happens, it's not a world-ending thing, it's something where, from our perspective, it would make the project a little bit less efficient. If you look at release, the odds that those females that are released would actually establish is very low also.

Q Now, where does the one in 50 million probability come from?

A So those are numbers that are established by Verily, and that is based on their multi-sorting process. So they have multiple steps that are used to check whether a mosquito is a male or a female, so it has both mechanical sorting based on size, there's also sorting based on visual computer estimation, and then they also do expert visual, like actually looking at mosquitoes.

It's very, very easy to tell male and female culex apart, which is great. Like I could teach a field

tech in, like, ten seconds the difference between a male and a female. They have really, really different antennae and so using those different sex characteristics, it's very easy to tell them apart with both the human eye and using computer visual methods. So Verily's sorting process uses a multiple step process to make sure that only males are being released.

Q Could you explain any other biological differences between the female and the male?

A Sure. So the most obvious difference is in the antennae. Because the males have to seek out the females, they have really feathery antennae that are extremely bushy. You can actually tell with the naked eye.

So if I walked up to the judge with one male if one hand and a female in the other hand and I was like, "Look," you would be able to tell the difference. So you can see with the naked eye. You can see even better with a microscope that you can tell with the naked eye.

You can also look at the palps, which are located on the head. So the female has two really short palps and the males have two really long palps that are nearly as long as the antennae themselves, so using the antennae is very obvious, and then using the palps is

also quite obvious sex characteristic.

Q Have the predictions for how many females are being released changed over time?

A Yes. So the more you do something in a lab, typically the better at it you get, right? One hopes. So what we've seen from Verily is that as their sex sorting improves, as they have more and more data, as they train up their visual sorting mechanism, that the rate at which you accidentally might miss a female gets lower and lower the longer you do it, so currently the rate, like I mentioned, is expected to be one in 50 million.

Q And previously you testified that that rate would be a low consequence?

A Yes.

Q Why is that?

A So because culex on the island of Maui already has Wolbachia, right, so the culex are already there and the culex already have Wolbachia and they're extremely -- they're extremely numerous, unfortunately, right? For both birds and people, they're very numerous and they love biting.

So they're already out there, they already have Wolbachia, so if you release a female with a different Wolbachia strain, that is not a catastrophic

impact in any way that I can think of. The impact is that if we release a lot of these lab-bred females, then the program becomes less efficient.

And so it really is, from our perspective, and from my professional opinion, the impact of releasing a female is just that the program makes your population crash slower of mosquitoes, right, so you might have mosquitoes for longer.

Q So let's say that a higher number of mosquitoes were released per release of male, higher than -- well, high enough to establish an actual population, what would the ecological impact be?

A So I'll explain a little bit. So these mosquitoes, this Wolbachia, they have bidirectional incompatibility, so what that means in practice is that you could actually swap your males to then a different Wolbachia strain. You could go back to the lab, you could do that whole Wolbachia swapping process all over again, and you could establish a different strain of males, right, that now don't match those females. So you could go back to the drawing board essentially, if that scenario were to happen and you could establish a new strain that is still incompatible with those females.

Q The existence of females with the original

lab-bred strain, would that have an adverse ecological impact?

A I can't think of any adverse ecological impact other than, as I mentioned, we would reduce the mosquito population maybe less quickly and, therefore, the birds would be exposed to more harm.

MS. STEED: Apologies, your Honor, we're going to present some of the same exhibits.

THE WITNESS: Okay.

(inaudible whispering)

MS. STEED: Thank you so much.

Okay. Can we use your --

MR. VANDEVEER: Is it Exhibit -- it might actually be up there --

MS. STEED: Yeah.

MR. VANDEVEER: -- actually. Let me check.

It jumped. I apologize. 14, 12, 10. Here it is.

MS. STEED: Thank you.

Your Honor, is it okay if I approach the witness with Exhibit P14 which was previously entered into evidence?

JUDGE TONAKI: Yes.

BY MS. STEED:

Q Ms. Ferguson, please take a moment to look

over Exhibit 14.

A Okay.

Q Okay. Have you seen this study before?

A I don't believe I have read this paper before.

Q Okay.

(inaudible whispering)

MS. STEED: Your Honor, may I approach with Exhibit 12 -- P12 was already admitted into evidence?

(inaudible whispering)

BY MS. STEED:

Q Ms. Ferguson, please take a moment to look that over.

A Okay.

Q Have you seen this study before?

A Yes.

Q Can you explain what this study is about?

A Yes. Okay. So this paper focuses on presatoid wasps. So parasitoid wasps are a type of wasp that are very unique in their lifestyle. They can only complete their development inside of other insects.

So if you'll allow me this comparison, the movie "Aliens" was based on this. So aliens is as if we had parasitoids, right? They develop in your body and then woo, they emerge from the host. So that actually does happen in insects. It's quite common. And

presatoid wasps -- the female will lay her egg inside an insect, the egg will hatch, the larva will consume the host from the inside --

(Audio from 3:43 to 3:53 not transcribed)

THE WITNESS: If I'm bitten by a mosquito, I don't care if it has a virus in its legs, I care if it has virus in its saliva in its mouth parts.

MS. STEED: Your Honor, considering that it's 3:53 p.m. should we recess --

JUDGE TONAKI: Well --

MS. STEED: -- knowing that the State will recall Ms. Ferguson at the beginning on the 15th?

JUDGE TONAKI: Now, Ms. Ferguson, are you able to -- the next date for this hearing will be August 15th at 1:30. Can you return?

THE WITNESS: Yes, I can.

JUDGE TONAKI: Okay. So we will end the hearing for today. The next hearing date will be August 15th at 1:30 and we'll go until four. I have identified another possible day.

MS. STEED: Okay.

JUDGE TONAKI: August 21st. Are the parties available at 10:30 until four?

MR. VANDEVEER: So August 21st at 10:30?

MS. STEED: Yes, that's fine for the State.

MR. VANDEVEER: That's fine for Plaintiffs, your Honor.

JUDGE TONAKI: Okay. So we'll set aside those two dates for a continued hearing, August 15th, 1:30 to four and August 21st, 10:30 to four.

MS. STEED: Would you like the State to file the notice of continued hearing?

JUDGE TONAKI: Yes, please.

MS. STEED: Okay. Thank you.

JUDGE TONAKI: Okay. Is there anything further?

MS. STEED: Nothing from the State.

MR. VANDEVEER: I have an administrative question for you.

JUDGE TONAKI: Yes.

MR. FRANKEL: You know, if we had a court reporter here, we could give them as glossary. There's a lot of these big words. I don't know how we can do it now with the -- with the automated things.

Is there any way we can get a glossary to the court reporter?

JUDGE TONAKI: Well, you could -- perhaps you could file a glossary, and then if a transcript is later required, then the court reporter could get that glossary because they will transcribe off of the

recording.

MR. FRANKEL: Right.

JUDGE TONAKI: Yeah. Okay.

MR. VANDEVEER: And when that will that be?

MS. STEED: I don't think there --

JUDGE TONAKI: And we will try and get court reporters for the next two hearing dates, but, of course, we know that's not assured these days.

Okay. Anything further?

MR. VANDEVEER: Nothing further, your Honor.

MS. STEED: Nothing from the State.

JUDGE TONAKI: Thank you, everyone. The Court will stand in recess.

THE BAILIFF: All rise. The Court is in recess.

(End of audio and video recording)

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REPORTER'S CERTIFICATE

I, MaryAnne Young, CSR No. 369, Certified Shorthand Reporter, certify:

That the foregoing is a true and correct transcript of my shorthand notes so taken.

I further certify that I am not a relative or employee of any attorney of the parties, nor financially interested in the action.

I declare under penalty of perjury under the laws of Hawaii that the foregoing is true and correct.

Dated this 13th day of April, 2023.

_____

MARY ANNE YOUNG, CSR No. 369