THE LEGISLATIVE COUNCIL SESSIONAL COMMITTEE GOVERNMENT ADMINISTRATION A MET ON WEDNESDAY 1 APRIL 2020.

FINFISH FARMING IN TASMANIA

Dr ALISTAIR HOBDAY, and **Dr KAREN WILD-ALLEN**, CSIRO, WERE CALLED, MADE THE STATUTORY DECLARATIONS AND WERE EXAMINED BY TELECONFERENCE.

CHAIR (Ms Webb) - Thank you, everyone. Welcome to Karen and Alistair from the CSIRO. Thank you for joining us.

I need to run through some things at the beginning of this hearing with you. Welcome to the committee. This committee hearing is being broadcast today. It is also going to be recorded on *Hansard* and it will be available to the public through the parliamentary website. The evidence you give at the hearing is protected by parliamentary privilege, but I remind you that outside this hearing privilege will not apply.

To begin with, I will ask you to make your statutory declarations; there will then be an opportunity to make some opening remarks if you would like to do so, and then we would love to ask you some questions. We will be taking it in turns to do that. It might be a little more awkward under these circumstances, but we will do our best. If there is anything you feel needs to be discussed with us in camera, you can make the request and we will consider the request at that time. Do you have any questions about that or do you feel ready to begin?

Dr HOBDAY - No, we are happy to go. I am a research director in Oceans and Atmosphere, one of CSIRO's business units involved in research for the salmon industry. We have an oceans and atmosphere group that both Karen and I work in. We also have a food and agriculture division that does some breeding work and we also have a health and biosecurity division.

The information we will be able to cover today is more on the environmental aspects, including modelling used to support decisions by government, by industry and by scientists involved in aquaculture. I emphasise that CSIRO is an independent research organisation. We undertake what we consider to be best practice and world-class research that's independently peer reviewed. We receive funding from government, we receive funding from industry and we also receive funding from philanthropic organisations. Despite the source of the funding, we continue to maintain this independent status.

We were pleased to provide a submission to the committee, and in that we have summarised some of the examples of research we have provided over the years and tried to emphasise the long history we have in transparent publication of that information. We support evidence-based decision-making and we look forward to the questions that you might have for us today.

CHAIR - Thank you. I'm going to start off with a few questions and then we'll move around to other committee members. I'd like to begin by asking you a bit about - it is situated within the Sustainable Industry Growth Plan for the Salmon Industry; I'm interested to know what role, if any, CSIRO played in the development or the review at that stage of the sustainable industry growth plan?

Dr WILD-ALLEN - As far as I'm aware, my team has had no official involvement in the development or review of this sustainable industry growth plan.

Dr HOBDAY - That's correct. The information developed prior to that plan included a range of workshops that scientists presented at, and we understand that government used some of that information in developing that plan. You'd be aware a second plan is also under development by government, which is called the Review of Tasmanian and International Regulatory Requirements. CSIRO was given a chance to comment on that plan.

CHAIR - Was that in recent times? What was the time line on that one?

Dr HOBDAY - On the second plan, that is the December 2019 version.

CHAIR - Okay. CSIRO provided comment on that draft and towards a final version?

Dr HOBDAY - That's right.

CHAIR - Okay. In terms of the workshops that preceded the first plan you were involved in, did that include providing input into the setting of a target? The sustainable industry growth plan puts forward an industry target the Government explicitly supports, which is that it would be growing to the size of a $2 billion industry by 2030. Is that something the CSIRO provided information towards, establishing that target?

Dr HOBDAY - No, we didn't formally provide information there. CSIRO's position is that that was a policy decision and we would provide research that would support the sustainable management towards any particular target, but again our research contributed to the material that I know the EPA used in deciding what were the different carrying capacities around Tasmania. Again, that's a line in the sand; we haven't crossed into actually recommending what the actual target should be.

CHAIR - So CSIRO wouldn't have a view on a recommended target, based on your research?

Dr HOBDAY - No, it's the combination of economic factors, the available space that's given over to those growth operations around Tasmania and then also the different carrying capacities, the different environments, and we didn't put all that together to make a contribution there.

CHAIR - So, you wouldn't have a formal view then on the appropriateness or otherwise of that target that's presented in the growth plan and supported by the Government?

Dr HOBDAY - No.

CHAIR - Okay. Anyone want any follow-up questions on that?

Ms FORREST - Moving on from that into another area. In your submission you talk about the CSIRO supporting the development of an industry-wide biosecurity plan. Can you talk a bit about this in terms of the proposed growth of the industry, how you see that led to evolve and what input you need to, or organisations like CSIRO, having input into?

Dr WILD-ALLEN - I can start off with that question. My team has not specifically done work with biosecurity for the salmon industry in Tasmania. However, we have recently completed a substantial amount of work in Chile and Patagonia with the Chilean salmon industry. Many of the issues in Chile were associated with biosecurity and we were able to provide modelling tools and

management systems for strategic as well as tactical decisions support for managing outbreaks of disease in Chilean waters. So in our teams, we do have the expertise to develop similar systems for Tasmania. We have not had that opportunity in the research environment to do that yet.

Dr HOBDAY - Can I give an example of one of those decision support tools, Ruth? You can imagine in Chile, they might have had some cages different distances apart. Our models can show how long it would take water to flow between those two locations and on the basis of how long the water would take to flow, you would get a sense of how long the disease would take to pass from one area to another.

The other way of looking at it is with nutrient loading. Depending upon how far cages or lease sites are apart, you can work out how far a nutrient load would propagate through the water to reach another location.

Ms FORREST - I am sure you are pretty much aware of the challenges in Macquarie Harbour and the new management of the harbour, with Tassal and Petuna working in partnership with models to manage the harbour. Tasmania provides security reasons as well as environmental reasons. The research done in Chile fed into that, or now does that; how has your research been utilised or is it completely separate?

Dr WILD-ALLEN - I am leading a small project team in Macquarie Harbour developing a biogeochemical model. We have an operational hydrodynamic and oxygen model which has not focused on the biosecurity issues. That project is being led by IMAS, by Jeff Ross; I believe you have already met him. We have experts in CSIRO who could contribute information on biosecurity issues, but, as I said, that has not been a priority for a research project to be realised at this stage.

Ms FORREST - Has the Government been asking for your input at all? We know they are working on a biosecurity plan at the moment. Have they not asked CSIRO for any input into the development of that plan?

Dr WILD-ALLEN - We have had the opportunity to show them our work and show them the research capability in CSIRO, but we have not been formally brought into a project to address that at this stage. We have been invited up; I met with the biosecurity people at DPIPWE and I was able to show them what we have done elsewhere so they are aware, if you like, of what is done in another country and the capability in Australia, but maybe that is something they are going to look at into the future. I am not sure.

Dr HOBDAY - I will just clarify, Ruth, that when the Macquarie Harbour initial modelling was done that allowed the development to get going, there was a tender process to develop the first model that would explore what the carrying capacity would be when the Macquarie Harbour initial modelling was done that allowed the development to get going there. When the industry and Government selected the successful tenderer, they went ahead and did the modelling in that case. There was no reason for us to do the same modelling, because we were not required to in that situation.

The work in Chile has been taking place in parallel and now it is a chance to bring those two things back together where there is appetite.

Ms FORREST - I just wanted to ask one more. The second is part b) on page 6 of your submission, where you talked about developing a developing a comprehensive modelling and risk assessment information system for the Chilean government.

That was what you were contracted to do or funded by the Australian Government to do. No two countries, let alone states, are the same.

Have you provided this to the Government as part of input into the biosecurity plan or in terms of a model that could be useful?

Dr WILD-ALLEN - Yes, I gave a seminar that was open to the public at CSIRO about the project - an overview - and specifically invited DPIPWE and the EPA, and a whole bunch of interested local parties to attend.

Then we had a morning tea and discussions, and we demonstrated the platform. There was plenty of opportunity for people to see it, if they were available that day, depending on calendars. They knew it happened, they attended, and there was an opportunity for following it up.

I think we have shown off what we did. We are quite proud of that. It is a pretty brilliant system.

Dr HOBDAY - Remember Chile's aquaculture is about a million tonnes of salmon a year. It is a very big operation. The team has also brought lessons from the international work back into projects they are now doing in Storm Bay.

Dr WILD-ALLEN - Yes. Some of the elements of the work we did in Chile are being deployed now in Storm Bay. We have a research program where we are one-and-a-half to almost two years into it. We will develop some of the connectivity analysis, metrics and some similar - depending on what stakeholders want, what the EPA wants and what DPIPWE wants in Tasmania, we will try to target the research output to meet their needs.

CHAIR - To follow up with a couple of things on the same biosecurity line, if that is all right, before we move on, to a different topic.

You have shown the modelling you can do and which you have developed in Chile. It would appear it has not necessarily yet been taken up here by the Government. Do you know if there are others who would be doing similar work that might be informing the Government in terms of doing that work for them here, or are you the only group you are aware of that does that kind of modelling you brought back from what you have developed in Chile?

Dr WILD-ALLEN - Yes, I mean, we work quite closely with Institute for Marine and Antarctic Studies and Geoff Rockliff's group.

They have some modelling capabilities. Hadley is a PHD student of mine, now a postdoc or a researcher there in IMAS.

I am not aware exactly of the research portfolio and all the projects that operate quite independently. I know they are funded through the Sustainable Marine Research Collaboration Agreement. So, the state Government can go to them more easily and regularly to ask them for input.

CHAIR - So CSIRO is not part of SMRCA?

Dr WILD-ALLEN - No. In order for us to engage, we need to frame up a research question, an area of work and then apply for funding. We are more project-based.

Dr HOBDAY - Meg, there is a research provider community out there in the world, consulting companies provide hydrodynamic modelling. Remember hydrodynamic modelling in its simplest case is just: how does water get from one place to another? The more complicated you make it, those models can include things like nutrients, oxygen and mixing processes. Depending on how much you are willing to pay, you can buy an off the shelf model from a consulting company. We might say we are more at the cutting-edge end of town from CSIRO and there are also different university clusters around Australia that undertake hydrodynamic modelling.

There is a group in South Australia that provides for the Southern Bluefin Aquaculture industry at Port Lincoln. There is the group in Western Australia that does hydrodynamic modelling that are looking at pollution around the Swan River Estuary. There are clusters of expertise in Australia that could be doing this work as well as us.

Mr VALENTINE - In your opening statements you talked about funding. I am interested in getting a clearer picture of the avenues for funding. You have mentioned them, but in percentage terms, how much of your funding comes from various areas? How do you determine which projects you are going to implement from that funding?

Dr HOBDAY - Let me tackle the funding one first. The CSIRO receives a portion of its funding direct from the federal government; that is not enough -

Mr VALENTINE - How much of that?

Dr HOBDAY - Across all of CSIRO or our particular Oceans and Atmosphere group? It is about $45 million for our Oceans and Atmosphere group; that is not enough to fund the research endeavour for a year, so we seek other partners in order to balance the budget. We would do partnerships with industry, with other government agencies and with philanthropic [groups?], and the level of co-investment we make depends on the degree of science to be done in a project. Our preference is generally not to take on what we would call 'cranking the handle' projects which do not have much research capacities through them; they are just delivery. In all the projects we do, we are looking for what the research advance can be made there.

Mr VALENTINE - You look at it broadly and say, yes, we could add value in this area, this area or this area, rather than just being an organisation that provides targeted research for any one of the areas you get your funding from. Is that what you are saying?

Dr HOBDAY - That is right and we also have our internal strategic plan so if Karen, for example, said she would like to come and work on fruit bats, we would say, no that is not within our mandate, we are an ocean research group and here is where our priorities are. Similarly, there are areas of aquaculture we do not particularly get involved with, like parasite research, for example.

Mr VALENTINE - One question in submission number 71 from the Derwent Estuary program, Ursula Taylor, who was one of the witnesses presenting to us on that day, says science projects need to be completed before finfish farming is expanded and referenced the CSIRO

biogeochemical modelling in Storm Bay. Can you explain what projects you have that are actually presently underway with regard to Storm Bay? Do you have any comment on, apart from what is in your submission, where you say this adaptive approach should not be at the expense of the precautionary principle? I am interested in hearing what projects you have underway and whether the move being made is more an adaptive approach rather than the precautionary approach. Can you comment on this?

Dr HOBDAY - We will take that in two parts. I will address the adaptive management and the precautionary approach and then ask Karen to talk about the particular projects in Storm Bay. There is a general feeling in CSIRO that the precautionary principle is one aspect to be taken into account when we are looking at how research should proceed and how research supports industry. The principle of adaptive management is it is an iterative process of decision-making that can be refined as new information becomes available. The precautionary approach when it is applied to adaptive management should be no decision would be irreversible as you learn new information. Irreversible is a subjective term, Rob, but generally it is my feeling that you should not proceed with something like a development that would not be able to be reversed within some reasonable period of time.

Mr VALENTINE - So if you take an area like Macquarie Harbour, quite clearly it would seem that went too far to be able to effectively manage the fishery in that space from the evidence we have received, but maybe you might have a comment on that. Do you think enough work was done before Macquarie was put into operation as a finfish farming area or what?

Ms FORREST - Can I talk on that question, Rob? When the decisions were made to increase the stocking level is when the real problems occurred.

Mr VALENTINE - That may be the case, but I am interested to know whether, in fact, there was enough research done to match the precautionary approach that should have been taken.

Dr WILD-ALLEN - I can answer that and I will have a go. Certainly, it is easy in hindsight to say we could have done things differently. We have been modelling the system now for probably about four or five years and in that time we have been able to constrain the flushing times and the flushing times were not probably well understood when the fish farm operations were put in place.

They might have had sites from various observing monitoring programs or all sorts of different evidence which they pulled together when they made their decision. However, they did not necessarily have the sophisticated, quantitative model that allowed them to estimate the flushing times for Macquarie Harbour, which we now know is unusually long. If you filled Macquarie Harbour up with red cordial, it would take several months for that to be washed away. Because of that, any environmental change which changes the organic material entering the harbour has quite a strong effect on water quality and oxygen.

In the past, there have been different environmental changes due to the logging industry, due to the opening of the bar with the harbour wall some 200 years ago and due to changes in the hydrology due to the damming of some of the rivers and the flows down those rivers.

Those industries, as well as fish farming, have all had an impact on the loading of organic material into the harbour and each has impacted in the dissolved oxygen. The fish farming is the latest one we are aware of but it is not the only one.

Dr HOBDAY - I think also the way you receive your adaptive feedback is by monitoring. Rob, your direct question was: was there enough monitoring going on in the harbour to detect that in time? Individual companies do their own monitoring and often they hold that commercial-in-confidence. Those companies are in competition with one another, which gives them good reason not to share their practices with one another, and there was very limited publicly accessible monitoring data that we could rely on to condition our models.

I think that in an environment where more data was being shared ,you might have seen it coming quicker and you might have responded more quickly. However, in terms of feedback, it was really picked up within one production cycle that too much salmon was being loaded into the harbour. So that adaptive response took place, I think, in a reasonably fast period of time. One year's production cycle. That is how quickly you are able to take off the pressure.

It is now looking at how quickly that has recovered. That would tell you whether you were precautionary enough.

CHAIR - Can we just bring that back then, Rob, to the start of that question asking also about Storm Bay because some of the other submissions we have had were around that and the Derwent Estuary program and others? What you described there, Karen, is that with Macquarie Harbour, while there was monitoring going on initially, there was a key piece of scientific understanding about flushing times that was not there at the beginning and that had to be caught up on later once negative impacts were being observed.

How can we be sure, or are you able to comment on whether we are sure, that the expansion into Storm Bay that we've now seen in recent years actually has enough science and all the pieces of the puzzle of science required to go forward with confidence? Are we operating under the right balance of a precautionary principle and adaptive management approach?

Dr WILD-ALLEN - That's a big question but I can tell you what I know from our research perspective about the science that has been done in Storm Bay. I moved to Australia in 2004 and the first project I worked on was in the D'Entrecasteaux and Huon estuaries looking at setting about the broadscale environment impacts of fish farming. Following on from there, we had pilot models for the whole of Storm Bay in 2010 to 2015; that was a project funded by CSIRO, a research-based program. It was called 'Informed' and I think Keith Sainsbury was very vocal in putting partners together for that.

At that point, IMAS also invested in a lot of observing and they had a monitoring program which they went out and did monthly. At that time, we couldn't get co-investment from industry and we couldn't get a big externally funded project so the models remained a pilot. Those models then were the best we could do at the time within our project-based research structure, and I believe some of the models were used then to look at particle tracking and the fate of pilot potential particles and scenarios which informed decisions on progressing the industry in Storm Bay.

Some of that work was done by IMAS using the CONNIE tool. The best available modelling fed into the decision-making and the projects that are underway at the moment are to - the first thing we did with our project was to review those models to determine how accurate they were and whether they were fit for purpose. Now we are charged with making calibrated models that are really constrained with observations, that they resemble observation, that they're the best they can be, that they demonstrate science excellence, and that we're really sure you can make a very expensive decision on them as much as possible.

The calibrated hydrogenated model - I was speaking to my team last week - will be available in August this year.

Dr HOBDAY - That sounds like a good summary of saying that Storm Bay has had a longer history of data collection and more widely spread data collection. It's had a longer history of model development than had been the case with Macquarie Harbour and it's also in a very dynamic ocean environment. So it has a much different circulation pattern that's more easily understood at the large scale than Macquarie Harbour. It has some features that make prediction slightly easier in that environment than in Macquarie Harbour.

Mr VALENTINE - There is just one part of my question, if we could cover the projects that you currently have underway in Storm Bay; I think Karen was going to address that. The question on that is, which of those projects do you believe really need to be completed before Storm Bay forges ahead in any major way?

Dr WILD-ALLEN - Our role at CSIRO is to provide the research to the decision-makers and it's up to them how they use that research and whether they decide to progress an industry or to make a political decision or an industry-based decision. We're a few years into a project of developing a calibrated biogeochemical model, and that model will have the capability of producing a now-time description of what the environment is today and for the next few days and also have the ability to provide a simulate a high-cast period for, say, the last two or three years, which you can then review and change in a scenario sense to say that if there had been fish farms there for the last two or three years, what would the water quality look like? That is, if you like, a hypothesis but it is based on the best information we had.

The synthesis of all these observations, the synthesis of our best modelling knowledge, and it provides a hypothesis of what the water would look like if they had fish farms in at a certain level. Then we can present this information to DPIPWE and to the EPA, and they can then consider that when they decide how many fish farms, or which trajectory they want to take the industry in.

That will be delivered at the end of 2021. There are stages of observations and stages of modelling that have to be done sequentially because, as you can appreciate, it involves a lot of [inaudible] experts and bringing it together. It is quite challenging. It is like herding cats.

Ms FORREST - You both talked a bit about the importance of the data and having integrated data available.

CHAIR - Ruth, are you moving on to data off this line of questioning? I have follow-ups on this line of questioning. If we are going to move into data, it is a whole another bucket.

Ms FORREST - [inaudible] has been monitoring the data that you have been talking about. I just draw your attention to the dot points on page 7. You said there was an opportunity to integrate some environmental data, [inaudible] projection, so that values [inaudible] industry data into a spatial [inaudible/model?] to inform decisions around the allocation of fish farm leases. You were talking about is being done in Storm Bay, for example. I am just wondering what you think in terms of the monitoring that is being done. What does the best practice model look like ensuring that we have the necessary data available and open to public view, if you like, [inaudible] understand? What is this sort of approach where you are saying more has to be done [inaudible]? What does that look like in terms of informing these decisions about expansion into Storm Bay or wherever it might be?

Dr WILD-ALLEN - I think IMAS has been champions of a lot of the work on values, societal values, and I think also the Derwent Estuary Program is quite experienced in that area. They take an approach where they first look at the societal values for a piece of water or a contested area. Then they can use that to define what needs to be monitored, or what needs to be preserved, and then how that can be monitored.

When you are thinking about a spatial planning tool according to that dot point, IMAS has already recently released a prototype system with DIS layers that incorporates many of these societal information about areas that are beaches that are used and areas of concern, and puts them in layers overlaying the aquaculture information as well of where projected leases are. It is like a toolbox that helps synthesise materials in many different places. I think the scope of the information would depend on the values, I would think, logically of what society has and what they really want to preserve. Maybe I am stepping outside of my expertise here.

CHAIR - Ruth, did you get that? Did you want to follow up on that, because I will if you, no -

Ms FORREST - No, I will say [inaudible] best practice looks like in this space, really. It is made of data breaches as well. [inaudible] baseline monitoring and how does that look? In terms of when we talk about societal values, it is about how we use public confidence that the work is done either to enable new marine farming activities to occur or the expansion of existing ones.

Dr HOBDAY - I think you would want to give the public confidence that the simulations for the models were performing accurately. In the case of data collection, for example, if we only had one oxygen sensor in all of Storm Bay, the information you got from that would tell you the model was working at that location, but you might not have confidence the model was working anywhere else. So when we design where those monitoring stations go, we would like to have good coverage through the area so that we can verify that the model is producing accurate answers in each location and then the public has then got that trust in what the model is telling them. And, on the basis of that trust, they can say, 'Well, I would like my oxygen levels to be *x* or *y*', and they can be quite confident that the model can give them a reliable answer about what that would look like if there were fish farms there or not.

CHAIR - Part of the issue people have, and this is what we have heard through a number of submissions, is that this is work being done and, in fact, some of what you have talked about is yet to be delivered next year even and further on, and is being done after decisions have been made and after expansion has already occurred into that new area of Storm Bay. The assertions made are that there was not an appropriate coverage of baseline data. There was some - and, as you say, there has been monitoring of various sorts there for some time - but whether that was a full suite that would be regarded as an appropriate and best-practice baseline from which to make those initial decisions has been some of the assertions made. Would CSIRO have a view on that? Clearly you do not have to describe what you are doing now, and we not looking ahead. This is just reflecting back. Did we have what would be regarded at the time as appropriate baseline date before those decisions were made?

Dr WILD-ALLEN - My perspective is sometimes when you are wondering how this is faring is to look internationally and to see what other people do and how they operate in this space. I had a quick look over the salmon industry report card put out by DPIPWE that compared the environmental regulation of Tasmanian salmon farming with those of several other countries. I

think that was a fair review. I think that the salmon farming - the way that the regulator, the EPA, has gone about setting up monitoring programs both in the water column and in the sediment, exceeds that of many other nations. I think in a way it is probably the lack of public confidence in the Tasmanian EPA and its ability to deliver on more regular monitoring of the industry because that is not what I see internationally; I see them doing a good job. That is just maybe more of a personal look.

Ms FORREST - One more point. Going back to the submission, you talk about Scotland and the regulatory agency there and the [inaudible] reports of the monitoring compliance data on public website and transparency of environmental conditions, such as decision-making and for the Tasmanian regulator to follow this route. You said that our EPA was doing a good job. Can you just clarify if the EPA is adequately in a transparent manner the things the community and other decision makers expect or is Scotland, for example, doing a much better job of this?

Dr WILD-ALLEN - I was speaking to the fact the Tasmanian ETA is doing the work; it may not be reporting it in a transparent way or as effectively as some other international countries are doing.

Ms FORREST - They have never had to [inaudible] is doing.

Dr WILD-ALLEN - I think they are definitely doing the work, but they may not be putting their best foot forward in disseminating that information. This may be the whole crux of the matter with public confidence. This is something really beyond the remit of CSIRO.

Mr FINCH - Just in your opening [inaudible] you talked about your submission to first plan. Also, for the second plan in 2019, could you give some idea of what the thrust of the CSIRO contribution was?

Dr HOBDAY - It was setting a clear objective, Kerry, in saying, these are the standards we expect to be met and setting benchmarks in line with community expectations. It was being fairly more explicit in the number of monitoring stations that would be required. The plan, for example, said things like 'consider increasing the number of monitoring stations', but it did not set a particular target or a goal so you would not know if you had achieved it.

Mr FINCH - Are you saying they were suggestions by the CSIRO or is that what was in the plan and your comment on it?

Dr HOBDAY - Our suggestions would have been to set concrete benchmarks and to be more specific with the amount of monitoring that was going to be imposed. Instead, the wording was a bit more ambitious in saying we encourage an increase in the amount of monitoring, we would like to see more transparency of data. It is our view the language could have more prescriptive in saying there will be 10 monitoring sites around southern Tasmania, data will be released within one month of collection by all parties or things like that.

Mr FINCH - Alistair, what happened to those points you made and the ideas you submitted? Have they each come to fruition or are they something DPIPWE, the department, the Government is taking on board in their future plans?

Dr HOBDAY - I hope they received those comments and think about how they revise those plans; that is the typical process of review we would expect. They would have canvassed opinion

from a range of organisations, and typically some refinement follows. As you would be aware, it depends on the political will sometimes for how much people want to be explicit about writing things into a plan.

Mr FINCH - Either the recipient of the results of the plan or what action the Government actually takes?

Dr HOBDAY - No**,** I would not expect to get comments back on my comments. I would expect that when I look through the plan, we would say, 'Oh yeah, they took that up or they did not'. Remember the review of a plan is kind of some opinions about what as a science organisation we would expect to be best practiced. There will be economic, social and commercial constraints, I assume, that also weigh into that side of decision-making. I am a bit out of my depth, Kerry, I have to say, with what happens behind those closed doors.

Mr FINCH - Is the submission you put forward to the plan public?

Dr HOBDAY - No.

Ms FORREST - Are you able to provide that to the committee?

Dr HOBDAY - No.

Ms FORREST - Not even as a confidential document?

Dr HOBDAY - No, I would prefer not to. We are asked to give our confidential comments on a draft that would help them improve. I think some of those processes are best done confidentially to help them come up with a best plan. I am not aware of the other constraints that would stop those from being implemented. I asked to be an example of some suggestions that were not picked up without the context of what the decision-making was, Ruth.

Mr FINCH - I have another question that might not be appropriate at this time. I want to know about the future of the CSIRO and its involvement with the program. What the quantum is, what the financial return is to the CSIRO? Is there an ongoing relationship into the future?

I can ask now or we can leave it until towards the conclusion

CHAIR - Can we park that one for the moment because we may also do that one as follow-up. I will come to Rob for some extras.

Mr VALENTINE - My question is in relation to something raised in submission 89, from the Tasmanian Peninsula Marine Protection Group. They were talking about hypersalinity emissions and disinfectants used. Virkon was mentioned in their submission.

Do you have any projects looking at hypersalinity and its effect on the environment and/or the effect of disinfectants going into the environment?

Dr HOBDAY - No, our research does not cover impacts on the pollutants themselves. I will ask Karen to comment on whether you would be able to track the dispersal of the pollutant and would at least be able to work out where it would end up, but we do not cover the effects.

Dr WILD-ALLEN - We do have a modelling capability where you could [inaudible] fine scale model to look at very high spatial and temporal resolution. The current Storm Bay model has a 200-metre spatial resolution, and the fine scale model could go down to maybe 40 or 50 metres spatial resolution. Over that, you could then maybe look at a discharge plume of where, and show where it moves.

In the case of salinity, we could map how salinity would mix. If it was a large volume of water, it might act as a coherent tracer. I imagine a vessel would not be discharging a very large volume in comparison to the volume of Storm Bay. It would probably be dispersed very quickly.

Consultants can do that sort of spatial modelling. I think TasWater regularly employs them to show how this spillage is spread around.

Ms FORREST - Following on from questions Rob was asking earlier, when talking about the [inaudible] approach, I note the submission says -

> This approach is adaptive, and allows for continual improvement. This adaptive approach should not be at the expense of the precautionary principle.

What measures need to be in place to ensure the current model, that adaptive approach, is being used?

We would not know at the expense of this [inaudible] what signs or warnings are there?

Dr HOBDAY - In order for the adaptive approach to work, you need to have monitoring in place, because the adaptive approach assumes feedback. If I discover an oxygen concentration of something, I will adjust something in my management, and so on. If there is not sufficient monitoring and collection of that data, the adaptive management is not possible at that scale.

With regards to whether the precautionary principle was followed sufficiently, you would want to set up your feedback system so you did not make a long-term change for the environment, for example, as the result of your lack of information.

An example would be: if you remove that fish farm from a location, because the oxygen levels were declining, you would want those values to recover with a period of weeks or months.

If your recovery was going to take years, I do not think you have applied the precautionary principle. There is some judgment in what is precautionary. On our land outside, if we stop farming, it will take 100 years for forests to grow back. That still allows some recovery, but it is not very precautionary if we wanted that land to recover within weeks.

In the ocean, in very high energy environments, you can recover very quickly. For example, a pollutant going into the ocean will be mixed in very quickly. Benthic impacts in a high-flow environment can recover very quickly, but in a closed bay, it takes a long time for those habitat impacts to be reversed. That precautionary principle, I have given you a wishy-washy answer, is about the values you hold and how quickly you would like those to be recovered.

Ms FORREST - Just on that then, we have received a number of submissions expressing concern about water quality and things like that around Long Bay and Stingaree Bay. The local residents there requested that additional monitoring be put in place. Tassal is the main operator

there. I understand they have been told additional monitoring was put in but it was not in the where the no-flows areas are and the other visual impacts they are likely to see.

You talk about the need for sufficient monitoring but the question is about how we ensure that monitoring is done in the right places when there are concerns raised. Tassal put in more monitoring, I understand, but it was out at the entry to the bay not in the bay, if that makes sense.

Dr HOBDAY - When we look at outputs from a model, they can typically tell you that you have three types of habitat: a red habitat, a blue habitat and a green habitat. Then you would want to have monitoring in each type of that. I cannot comment to the specifics of that case, Ruth, but if that was a low-flow environment, and it would a unique one, it would have to be monitored separately from monitoring the blue or the red areas somewhere else. You need to resolve those different habitats clearly and if that were a unique environment, it should have had its own monitoring.

Ms FORREST - It comes down to decisions about what sort of monitoring, how often and where. Is that it? Like a situation where it takes a long time to recover ?

Dr WILD-ALLEN - We have extensive research literature on how to design monitoring programs for the D'Entrecasteaux and the Huon. I was involved in the committee that designed the monitoring program in a broadscale environmental monitoring program for that area. I brought to the table results from the model which suggested particular locations were vulnerable. That was not sufficient to design the monitoring program. It also required the expertise from a lot of historical knowledge of science experts in different disciplines, benthic experts.

A lot of things are put together when you have to consider a monitoring program, including trigger values and actions that should happen when triggers are exceeded. I cannot speak to how this monitoring program in Long Bay was formulated.

Ms FORREST - There are research-based models that tell how, where and when type of thing. Is that right?

Dr WILD-ALLEN - There is probably a best practice procedure for designing and monitoring programs.

CHAIR - Just to follow up on that, would it be your understanding then that, given the circumstances here, it would be down to the EPA to direct the parameters of those monitoring programs to ensure there is the right balance to inform an adaptive approach with the precautionary principle in mind?

Dr HOBDAY - I think there is a role for the EPA there, but there is also a role for the industry in that they want to maintain, for example, an eco-certification by the Aquaculture Stewardship Council so that they can demonstrate their production is not impacting on the environment. There is an incentive for industry to also demonstrate good stewardship, which is why I think the data-sharing approach is really important. There will be industry motivation for collecting data and there will be an EPA motivation for collecting data. I do not think it is resident in just one of those groups.

Dr WILD-ALLEN - I can add there is also a research need to collect data that may be on a different time and space scale, for example, to calibrate the model. Different monitoring programs are for different purposes. There is no vanilla program that fits everybody's needs.

CHAIR - I am mindful we have used up most of our time.

Mike, I think you're back here with us now. We're towards the end of our time. Is there anything you wanted to follow up or ask questions about before we close?

Mr GAFFNEY - No, that's fine.

CHAIR - Apologies for the coming and going there.

Karen and Alistair, is there anything we haven't covered today that you wanted to, in closing, perhaps make mention of or highlight for us?

Dr WILD-ALLEN - I think there was one outstanding question - was it Kerry who asked about whether there was an ongoing financial arrangement for research?

Mr FINCH - Yes, please**.**

Dr WILD-ALLEN - In my current research program, the final stage of the work is to include how to maintain these models to a high standard going forward - if you like, to operationalise this work - to make sure that at the end of three years we don't just leave it all in a filing cabinet but the research remains relevant, remains working and remains able to inform decision-makers.

Dr HOBDAY - That was the model used with the Chilean work. At the end of that research project, the regulators have been handed that particular model and now they run it as one of the ways they use to support their decision-making. We would seek that kind of outcome from all our projects in this area.

Mr FINCH - That research that you were doing as part of your work with CSIRO: does it have a link to the EPA or to the industry for work they need to have covered by the CSIRO?

Dr HOBDAY - Again, Kerry, it would be a project-based arrangement. For example, with some of the salmon companies we have what's called a research partnership agreement where there's an agreed package of work that's completed over a year. Some of that, for example, is in the selective breeding program where CSIRO scientists are trying to breed disease-resistant salmon. Those are direct relationships between industry and CSIRO; in other cases it's brokered through another government agency but we don't have direct relationships with the EPA.

Mr FINCH - Is there work directly [inaudible] -

CHAIR - Kerry, I am going to pull you up there. We've all had trouble hearing that or certainly at this end and at Hansard we've had trouble. Could you repeat that as clearly as you can.

Mr FINCH - …I'm just wondering whether this is [inaudible] -

CHAIR - I am sorry to interrupt you, Kerry, but we can't hear you at all at this end and Hansard can't hear. What we might have to do is put those questions as follow-up questions on notice

through to Karen and Alistair, if that's okay, and get the answers back in writing given the challenge we're having.

Dr HOBDAY - I can lipread and I know what Kerry said.

CHAIR - It's okay. We don't have the question accurately for Hansard, though, because we didn't catch it at this end or on the recording so we'll follow it up with you and put it to you in writing. If there are other things we missed or that we didn't get to in the time today, we might put those to you in writing as well, if that's all right.

Thank you very much for your time today, Karen and Alistair. We really appreciate it, especially given the interesting circumstances of doing it all remotely. Thank you for your patience and perseverance with that with us.

Dr HOBDAY - Thank you very much for the opportunity.

THE WITNESSES WITHDREW.

Dr SHEA CAMERON WAS CALLED VIA TELECONFERENCE, MADE THE STATUTORY DECLARATION AND WAS EXAMINED.

CHAIR - Thank you very much for joining us, Dr Cameron. Can we call you Shea in this hearing?

Dr CAMERON - Yes.

CHAIR - I need to run through a few things with you as formalities here to let you know that this hearing is protected by parliamentary privilege. Comments you make here will be protected but once outside of the context of this hearing that privilege will not apply. We are recording this hearing on *Hansard* and that will be available through the committee website at a later date. We are also broadcasting the hearing today so that people in the public can be watching along also.

If there are matters you believe should be heard in camera, you can make that request of the committee and we will consider that request at the time.

The way we are going to proceed is that I am going to ask you to make your statutory declaration and then if you would like to make some opening comments, you are welcome to do so. We will then follow that up with some questions from committee members. Does that all sound clear and appropriate for you?

Dr CAMERON - Yes.

CHAIR - Thank you for that. We will forge ahead. We think we can catch it but maybe try speaking a little more slowly and clearly for us to help out. Thank you. Opening comments if you would like to make some.

Ms FORREST - Some details about your background would be good too, Shea, just for the record.

Dr CAMERON - First, I had better start with the disclaimer. It is important to mention that although I work in the industry, in this submission I do not speak or represent the views of any of the aquaculture companies. The views in my submission are mine and are based on my observations and experience. I am here on my own time and my time alone.

My main point is to get across that the industry is an important and valuable part of Tasmania's future. As such I am [inaudible] work at the moment in this strange and sort of scary time.

My background is that I am actually a marine ecologist by training. I was born and raised in South Australia and that is where I studied. I have worked as an aquaculture diver, R&D pilot and technician and now in marine operations for the last seven years with two different aquaculture companies. The first one was Marine Produce Australia in the Kimberley, and Huon Aquaculture in Tasmania. My current employment is Huon Aquaculture here in Tasmania.

In terms of my submission, I have six main points. The first one was the value of the innovative aquaculture industry. With this I would like to expand on my submission with a couple of examples. The salmon farm industry in Tasmania, according to the Salmon Growers Association, employed 2390 direct full-time jobs. There are also 6000 full-time equivalent jobs in supporting roles. In my

submission, I mentioned how innovative the salmon farms are, but also how the supporting roles are innovative as well.

There are three Tasmanian businesses I would like to highlight: Southern Ocean Subsea, abbreviated to SOSub, which is based in Kingston; Aqua Clean Tasmania, based in Geeveston; and Lyndcraft Boats, which is based in St Helens.

Southern Ocean Subsea employs approximately five people full-time and they provide sales, design and repair of remotely operated vehicles. In this case we are talking about submersibles.

This business began when I tried and failed to hire our friends as technicians that were aquaculture's place to send, instead they quietly refused me and would only work with contractors. They grew their business to support and prosper and service that industry. They now build custom ROVs for the Antarctic Division, DPIPWE and Huon Aquaculture, and then service a wide range of ROVs from makers around the world. The work they are doing is world-class. They employ three other staff now as well as the two original technicians. They collaborate with international and national companies on projects.

Aqua Clean Tasmania is based in Geeveston in the Huon Valley and they make replacement nets and they are selling these to the mainland and Norway. These vehicles are amazing and designed right here in the Huon Valley.

The other one I would like to talk about is Lyndcraft at St Helens. They build motor [inaudible] boats and lots of aquaculture boats for Tasmania and the mainland. They are so well regarded by the industry. Their last boat came out of the shed in St Helens last week and it went up to a mussel farm on the mainland on the New South Wales south coast. The barramundi farm I previously worked for in the Kimberley had a Tasmanian marine operations manager and has been receiving a steady stream of Lyndcraft boats by trucks all the way into the water at Buccaneer Archipelago in the Kimberley. The operations manager did not buy those boats because he was homesick; he bought them because they were the best solution for finfish farms.

Lyndcraft sat down with the Aquaculture people and designed boats [inaudible] for use in the future and it is a good example of how we have trained all these people in the institutions we have here - IMAS, CSIRO. People move around wherever, but they take the Tasmanian products designed here and shift them to the mainland. We are punching well above our weight in aquaculture equipment and expertise, something we should be proud of.

The main thing I would like to highlight is how valuable that innovation is and anything we can do to keep that innovation growing is incredibly valuable for us as we progress into the twenty-first century.

CHAIR - Thank you. One of things in your submission that I would like you talk more about is the integrated multitrophic aquaculture you have suggested as a way forward and potentially valuable for Tassie to focus on. Could you talk more about that?

Dr CAMERON - I would love to. I am a relative newcomer in integrated multitrophic aquaculture. I am by no means an expert, so please understand that. There is an excellent project been done out of [inaudible] with Dr Craig Sanderson and also IMAS; I think it is the Intrepid Foundation in the Huon Valley - sorry, Bruny Island - looking at kelp farming. Both those projects are looking at using kelp as a crop to use some of the nutrients in the by-products from fish farms.

With integrated multitrophic aquaculture, you are clustering a whole bunch of other species around a finfish farm. Usually, the example is mussels and kelp so you are using up the nutrients the farm would normally dispel into the water around it.

CHAIR - Do you have suggestions about how we could be exploring this here or an avenue or mechanism for us to be expanding that opportunity?

Dr CAMERON - It is something that possibly should be included in the marine planning process. The suitability of leases to allow for other parts of aquaculture within that single lease or whether we can find a way to encourage companies to progress along that path. I suppose Huon and Tassal are already beginning to look at these, that is not [inaudible] aquaculture. We should try to encourage more from a regulatory point of view.

Ms FORREST - The marine economy you may [inaudible], but we have seen in a number of submissions, not just yours, about our natural kelp beds, and how they have disappeared over the years. I am not saying salmon farming is the cause, but I am interested in what your views are of the overall reason that has been occurring. In terms of re-establishing these natural kelp beds, do you think that it is the goal of the marine farming companies to do all that or a separate business entirely? I am interested in your thoughts.

Dr CAMERON - I cannot comment on the losses to the kelp beds. That is primarily due to temperature and that is probably a question for IMAS more than me - sorry I am a mainlander. One of the things in my submission is that you can [inaudible] with this kind of aquaculture. Some of the things the government can do - much like they did with the start of the salmon farms - is start common use kelp factories. Okehampton Bay - part of Craig Sanderson's work with Tassal was to reforest parts of the Eaglehawk Neck. In partnership with the Eaglehawk Neck data centre, he was to look at reforesting some of those kelp beds. I am not sure this will be a question for him, but they actually started reseeding those kelp beds using stock from their farm they were putting in, as well as other stock they grew in the hatchery, so the by-product. If you encourage all of the infrastructure, the only way economically to be able to reseed all of the kelp is with commercial funding and that would have to be through farming.

Ms FORREST - To clarify what I think you said earlier, to do that is to have this sort of integrated approach considered in the management plan?

Dr CAMERON - That is something that could be considered at the management plan stage. It is valuable for us to begin to plan. For example, if you are putting a new aquaculture lease in, whether that is suitable for us to put smaller players in alongside, or whether the person who proposes that lease can say, 'I am happy to farm here that I have a small start-up company', because they have the small start-up companies now, particularly in the US approach. There is a fantastic organisation called GreenWave which is sort of a grassroots aquaculture start-up sponsoring and mentoring small farmers creating small seaweed farms where they are similar to [inaudible] farms are, start-up farms. You have to say to the company, 'We can have *x*, *y*, *z* small farms on our corner lease here using us for that infrastructure and grow kelp commercially as a side within our lease'. That would be something valuable if we could consider in the marine farming process.

Mr VALENTINE - In relation to one of the submissions received- submission no. 1, from Brian Hinson, who has 50 years experience in fishing. He was talking about the farming of flathead under pens. Have you heard of this? I realise you are an ecologist and you are talking about kelp,

but have you heard of other species being farmed in conjunction with salmon farming under the pens?

Dr CAMERON - Primary, it is alongside the pens so it really mussel ropes and kelp. Flathead, I am not sure of the biology. It would be another question for an IMAS fish biologist as to whether it is economical to farm them and whether you could actually commercially farm them.

Mr VALENTINE - You mention in your submission that land-based aquaculture might see production moving out of Tasmania and going elsewhere. If you look at all of the expense of salmon farming, do you think it is something that ought to be looked at in any event? The Tassie brand is pretty strong when it comes to the clean, green image we have. Do you think that might still be a value in actually doing land-based in Tasmania because of that branding we have, and also the expense of land and also the lower value of land. You mention this towards the bottom of the first page, and on the top of the second page. Have you looked at the whole landscape, if I can put it that way, on that issue? You seem to suggest that if land-based happened, it wouldn't happen in this state.

I am looking at the cost of actually doing sea-based, and it is really quite significant when it comes to things like boats, cleaning and all those sorts of things that have to happen, and the way that companies have to deal with all that infrastructure in the sea. Would it not still be viable to look at a land-based operation here, where the brand is really good?

Dr CAMERON - I can't really comment on the economics of land-based versus sea-based in Tasmania. I am sure people are looking into the economics of whether we could do things on land. Obviously, it is much easier to do things on land sometimes than to go out into the ocean and farm.

I can't comment on those economics. I don't have those figures in front of me. [Inaudible] it would actually move to offset the cost of transport, which means it would move to the mainland.

Mr VALENTINE - Because you mentioned it, I thought I would touch base with you on that particular aspect.

Mr FINCH - Just something here about the integrated multitrophic aquaculture. What is the meaning of that? Can you please explain?

Dr CAMERON - Yes, it is the different feeding levels. You have your algae which are taking energy from light, using the nutrients from the sun. The mussels are filtering the [inaudible]. Essentially you have a primary producer, which is your algae, primary production. Then you also have secondary production, your mussels and your salmon. It is farming different trophic levels.

Mr FINCH - Your integrated multitrophic aquaculture approach, you are cutting through with this suggestion, and this idea, to develop it like a ministerial level?

Dr CAMERON - It's not my idea. I cannot claim any credit for it. It is being looked at for Okehampton Bay by Tassel at present. It is also being looked at around the world, in Chile, and also in Norway, Scotland and Ireland.

Mr FINCH - Those three companies you mentioned in the first part of your presentation, Shea - they are examples, you say, of this aquaculture industry, the salmon industry, we have in

Tasmania. These are beneficiaries and this is one of the add-on opportunities created because of the development of the industry in Tasmania?

Dr CAMERON - Yes, all of them are creating products specifically for the aquaculture industry and also exporting these products, not just to the local market, but to the international market.

Mr FINCH - What you are suggesting is that if we support this salmon industry, the aquaculture industry in Tasmania, that will lead to more success stories with companies like this benefiting from a burgeoning industry?

Dr CAMERON - Both Southern Ocean Subsea and Aqua Clean Tasmania have existed for only the last four years. Lyndcraft has been going for a lot longer than that. They are just three examples that have cropped up in the last five years of the industry. That has been the technological uptake we have had. Possibly there will be more growth as they grow. It is up to those businesses really, I guess, how far they will go and what technology they will take on.

Mr FINCH - I'm interested in your own take on the future of the industry in Tasmania. Is this where your future lies? Will you stay in Tasmania with the development of the industry here?

Dr CAMERON - I am from the mainland, but my two youngest children are both Tasmanians now. If I take them anywhere where it is warmer than 26 degrees, they tend to drag me back down.

Mr FINCH - You see your family's future is here in Tasmania and this growing industry, and that it is growing on into the future?

Dr CAMERON - My background is not an aquaculture background, but I am very happy where I am at the moment. I have quite a good job and I am very proud of what I do.

Ms FORREST - In point (5) of your submission, you talk about marine farm fee leases being increased and you argue against this. There are some who [inaudible]. Can you expand on your views as to why that's not the most appropriate mechanism?

Dr CAMERON - In my submission, any kind of cost increase will incur a penalty somewhere else down the line so it will stop the companies becoming [inaudible], and tend to invest in the research and development, which is what I see as the benefit we're getting out of it, especially in the last five years. Also, if you increase the lease farm fees, you start making it more complicated for these smaller players to come in, especially with seaweed farms or oyster farms. It would add an extra layer of red tape. You would have to sort through and scale it, and you would have to be stratified [inaudible] some of the bigger companies. It would make it a more complicated process for companies to start producing.

I think you are much better off to try to encourage the companies to spend as much money as possible in the research and development side of it than increasing the lease farm fees. That's my personal opinion.

Ms FORREST - Your company was going to - I'm not sure because I've never thought about whether they can - sublet or sublease an area of their lease to another smaller operator to grow kelp or something like that. Is that how that works?

Dr CAMERON - I don't know how the planning mechanisms work so I can't comment on that. It could be more sort of combined but if you could actually open up to smaller companies to come in and farm and whether you could use that as a [inaudible/incentive?], especially with the kelp farms.

Ms FORREST - Just to appreciate [inaudible] of increasing [inaudible] or not. You are probably aware of other models around the world where they pay significantly high lease fees, like in Norway, for example, and a lot of that goes back to the local community.

I appreciate the employment that goes into the local communities and sometimes they support the local sporting clubs, a lot of big companies. Isn't there an argument that bigger companies with big balance sheets, or bigger balance sheets - I'm not talking about what we're facing at the moment, I am talking about in broad terms because who knows what the companies are facing right now - but when they are being profitable, will it be reasonable to expect the big ones to pay a higher payment for the benefit of using our sea and a [inaudible] system for the smaller ones that would still allow smaller ones to come in?

Dr CAMERON - I just worry that we're going to make it more complex and put barriers in. I think we should be looking at whether we can use the current system we have now more efficiently, whether we partner up with smaller companies as well. That's my concern.

CHAIR - I'm interested, Shea, in the argument you mount that by charging more for leases, we will discourage companies or push them to spend less on research and development. Do you have evidence that would show that Tasmanian or Australian companies, in not paying high lease fees, spend a greater proportion of their profits on research and development than in other countries where there are higher lease fees?

Dr CAMERON - I can only speak anecdotally, but I know that Tasmanian companies are braver. The only measure I have of that is that we took up a lot of net cleaning research and development before Norway. We bought remotely operated vehicles off the Norwegians and they weren't as ready to dip their toes into it.

There are a lot of new products. The wellboats we use here are more technological and better equipped than the ones they have in Norway until the Norwegians build the next generation. All I can say is from those observations is that here they are willing to try a different way of doing things. My worry is if we increase lease fees, we are going to become less brave and more conservative.

CHAIR - Presumably if companies had to pay more for their leases and therefore their profit margins are getting tighter, they would have an extra motivation to do things more effectively and well to best get their margins out of their efforts. You seem to be describing a correlation, not necessarily a connection, between the two things; between the setting of lease fees at a higher or lower level and the R&D investment. You are making an anecdotal comment about Tassie being quite forward-looking, which is really great to hear, about R&D and about innovation. But is there anything you can tangibly point to that says that Australian companies, or Tasmanian companies, invest more in those things because they are given lower lease costs?

Dr CAMERON -Ultimately it is up to the companies to look at the economics of what happens and then what their financial ramifications are. I only work in the marine ops side of things.

CHAIR - That has covered most of the things I wanted to ask you about as well across that mix. Mike, we had a message from you, I think you are right but please jump in if you want a follow up.

Mr VALENTINE - There was one mention on page 2 of your submission, Shea, under point (3) on the second page, zone leases with salmon farms in the middle that are surrounded with potential seaweed and mussel leases. I was interested that you were talking about mussel leases. What is your experience of that? I would have thought mussel leases would be in much more shallow areas. I am interested to know why you see that as a possibility?

Dr CAMERON - Part of the integrated multitrophic aquaculture approach is mussels as well as kelp. You can hang mussels off long lines in deep water. They will grow quite happily there.

Mr VALENTINE - They are not on trays and those sorts of things like oysters. You are saying that they are suspended in deeper water?

Dr CAMERON - Yes, most mussel farming occurs on long lines so they will hang lines down from lateral main lines and mussel lines will hang down from that.

Mr VALENTINE - Thank you for that clarification.

CHAIR - If there are any things you might want to make some closing remarks about, Shea, that we have not covered or that you wanted to expand on more from those questions before we wrap it up.

Dr CAMERON - No, I am happy with the questions and thank you for the opportunity.

CHAIR - Thank you very much for your time. We really appreciate your submission and your particular insights because of the role you play and your experience in the industry. Thanks a lot for the submission and your time today.

THE WITNESS WITHDREW.