OFFICIAL REPORT
AITHISG OIFIGEIL

Environment, Climate Change and Land Reform Committee

Tuesday 6 February 2018

Session 5

The Scottish Parliament
Pàrlamaid na h-Alba

Tuesday 6 February 2018

CONTENTS

ENVIRONMENT, CLIMATE CHANGE AND LAND REFORM COMMITTEE
5th Meeting 2018, Session 5

CONVENER

*Graeme Dey (Angus South) (SNP)

DEPUTY CONVENER

*John Scott (Ayr) (Con)

COMMITTEE MEMBERS

*Claudia Beamish (South Scotland) (Lab)
*Donald Cameron (Highlands and Islands) (Con)
*Finlay Carson (Galloway and West Dumfries) (Con)
*Kate Forbes (Skye, Lochaber and Badenoch) (SNP)
*Richard Lyle (Uddingston and Bellshill) (SNP)
Angus MacDonald (Falkirk East) (SNP)
*Alex Rowley (Mid Scotland and Fife) (Lab)
*Mark Ruskell (Mid Scotland and Fife) (Green)
*Stewart Stevenson (Banffshire and Buchan Coast) (SNP)

*attended

THE FOLLOWING ALSO PARTICIPATED:

John Aitchison (Friends of the Sound of Jura)
Anne Anderson (Scottish Environment Protection Agency)
Dr Sam Collin (Scottish Environment LINK)
Mark Harvey (Highland Council)
James McKie (Marine Scotland)
Edward Mountain (Highlands and Islands) (Con)
Rob Raynard (Marine Scotland)
David Sandison (Scottish Salmon Producers Organisation)

CLERK TO THE COMMITTEE

Lynn Tullis

LOCATION

The Robert Burns Room (CR1)

Scottish Parliament

Environment, Climate Change and Land Reform Committee

Tuesday 6 February 2018

[The Convener opened the meeting at 09:31]

Decision on Taking Business in Private

The Convener (Graeme Dey): Good morning and welcome to the Environment, Climate Change and Land Reform Committee's fifth meeting of 2018. I remind everyone who is present to switch off electronic devices of any description, as they may affect the broadcasting system.

I welcome to the meeting Edward Mountain MSP. Mr Mountain is attending in his capacity as an individual MSP.

The first item on the agenda is consideration of whether to take item 3 in private. Are we all agreed to take that item in private?

Members *indicated agreement.*

Salmon Farming Environmental Impacts Inquiry

09:32

The Convener: The second item on the agenda is evidence from two panels of witnesses in the committee's inquiry into the environmental impact of salmon farming in Scotland.

I remind everyone that the focus of the committee's inquiry is on the report that was commissioned by the Scottish Parliament information centre and undertaken by SAMS Research Services Ltd into the environmental impacts of salmon farming in Scotland, so we will not discuss any non-environmental issues. However, the committee's report on the work will be considered as part of the Rural Economy and Connectivity Committee's wider inquiry into salmon farming in Scotland. I therefore ask all the witnesses who will give evidence to restrict their responses to environmental impacts.

I welcome the first panel of witnesses: John Aitchison, a member of the friends of the Sound of Jura; Sam Collin, the convener of Scottish Environment LINK's aquaculture sub-group and a marine planning officer at the Scottish Wildlife Trust; and David Sandison, the general manager at the Scottish Salmon Producers Organisation.

Let us get straight into questions. Have the environmental impacts and concerns regarding salmon farming changed in any way since 2002, or are they fundamentally the same?

Dr Sam Collin (Scottish Environment LINK): The SAMS report highlights a lot of concerns that we consider important. It is worrying that we still cannot answer some of the key questions even though they were raised in 2002. There is a growing body of evidence of salmon farming's impact on the environment, but we still lack enough data to clarify what that impact is. Therefore, as we are unable to answer those questions, there has not been much change in the practices of salmon aquaculture.

David Sandison (Scottish Salmon Producers Organisation): I welcome the opportunity to discuss the report. It is good that the committee has decided to consider it in comparison with the 2002 report, "Review and Synthesis of the Environmental Impacts of Aquaculture". The risks that are associated with the business of salmon farming will be exactly the same. They are well quantified and well known.

The issues that come out of the report are whether we understand the impacts of salmon farming and whether we have the right information to measure those impacts in Scotland. From that

point of view, the report is reassuring in that, when it analyses those risks, it puts most of them in the low risk category, although I am sure that one or two will receive the committee's focus. Those risks are still being dealt with and managed, and we still need to find the answers that we seek on them. That is the important issue that we need to discuss further today.

John Aitchison (Friends of the Sound of Jura): I cannot agree with that, I am afraid. The problems are the same but their scale is much worse. There has been an enormous increase in sea lice, and there is solid proof that the sea lice affect the populations of wild salmonids, which include sea trout, not just salmon. The pollution aspects are also much clearer now than they were before—45 sea lochs have been polluted with industrial chemicals. The chemical use is enormously increased because of the sea lice. It is on a different scale and the impacts are much larger.

The Convener: How much progress has been made since 2002 on the science and data that are available to inform policy on salmon farming? How much better is our understanding of the impacts?

John Aitchison: The report says that there is no information on almost every subject. On every category, it says that it is amazing how little information there is. One of the big questions is: why is there so little information from Scotland? That is usually the excuse for not dealing with sea lice. Norway, Ireland and other countries are doing enormous amounts of work on that, but it is not done here.

David Sandison: It is fair to say that the aspects of fish health that are most important to success in growing our livestock are the core of our business. In that regard, we understand and acknowledge that there are gaps in the data. We could definitely enhance that further.

The industry has been chastened for a long time about the supply of information on sea lice numbers on the farms in Scotland. For the committee's benefit and for the wider public, I can confirm that, from here on and forthwith, we will publish all data on sea lice counts on farms in Scotland on a farm-by-farm basis. That will back up the decision that the SSPO board took in November last year, which is now in the public domain.

The Convener: Why now?

David Sandison: We need to move the debate forward. We hear all the arguments and the background noise, but we want to have a proper open and honest dialogue about the status of farm sites in Scotland. If that data can be of use to the scientific and research community and can move us forward, that is fine. There is absolutely no problem with our being completely open and transparent about that data. There is nothing that we wish to hide away.

The Convener: Given the concerns that have previously been expressed about how that data might be used, will you publish it with a time lag?

David Sandison: We have not got to the point of working out the detail. Inevitably, there will be some time lag, because it takes time to gather and check data before it is possible to release it.

Some detail is under discussion in the group that has been formed to consider the fish health framework for Scotland for the next 10 years. That is a Government and industry group with representatives from many regulators. I believe that the detail of how that data should be used and published will be part of the group's remit.

Dr Collin: It is welcome news that the industry will publish those data. However, we would like historical data to be published as well. We are talking about adaptive management and learning from impacts and the data that have been collected. It takes time to collect and monitor data, which will delay any conclusive results and action. If we have the historical data, we can begin with a wealth of data and start to make changes now.

The Convener: David Sandison is nodding his head. Will that historical data be available?

David Sandison: We are very happy to consider what we can provide that will help the debate. There is data available. It is not as though the industry has not been gathering and publishing the data; it has been published in regional format for the past five or six years in quite a bit of detail. We need to consider that data. Data is extremely important, and we need to know how to use it to the best advantage of all.

John Aitchison: It is welcome, but it has come about as a result of the information commissioner enforcing the decision to publish the data—something that the Government refused to do, because the industry said initially that it did not want to. However, it is good that it is happening now.

The previous aggregate data concealed the massive spikes in sea lice numbers on many farms. For instance, one farm on Shetland has 20 adult female sea lice per fish, whereas the threshold for action is eight—which, in itself, is very high given that the threshold in the code of good practice is one. Those spikes are doing the biggest harm, so that information needs to be not just published but acted on instantly. Something needs to be done, because the billions of sea lice larvae that are being produced on those farms are killing sea trout and damaging and killing salmon.

Mark Ruskell (Mid Scotland and Fife) (Green): Will the industry also publish data on salmon mortality, broken down by farm and with the reasons for those morts set out?

David Sandison: Yes. We will provide mortality data at farm level and will, from time to time, give a commentary on any disease issues that might be associated with that mortality.

Mark Ruskell: Will there be historical data alongside the data for sea lice?

David Sandison: Part of our commitment in establishing the fish health framework group, which is looking at the 10-year strategy, is the provision of five years of historical mortality data, which will be annualised and comparative year on year. At the moment, we have data up to 2015; we still have to complete the production cycles for 2016 and 2017.

The Convener: I note that we have strayed into the issue of sea lice. Before we move on to that issue, I want to ask, as a scene setter, a question about the general direction of travel. Can any or all of you point to examples of the precautionary principle influencing the growth of the sector?

John Aitchison: I was interested in what Professor Verspoor had to say in response to that question. Speaking on behalf of the whole panel—and having reviewed all the scientific evidence—he squirmed around and said that there had been an attempt historically to work together. That was it—that was the precautionary principle as enunciated to this committee. It was really poor, and the fact is that no such principle has been applied.

David Sandison: There are a plethora of examples of that, one of which is the arbitrary limit on the maximum scale of a salmon farm site in Scotland. That has been in place for a long time now, and it means that, as far as the modelled scale of a farm in Scotland is concerned, it can be only a certain size. There is an element of precaution in that.

Moreover, the environmental quality standard that is used for every consent to activity on a salmon farm is set at a very precautionary level. On that basis alone, significant precaution is built into the consenting process. Scotland has a world-leading consenting process, and we are renowned for having a strong regulatory background to what we do. We must acknowledge that an element of precaution will be built into that.

Dr Collin: The 2,500 tonne limit on salmon farms is actually a limitation of the depositional model that has been used. That is why the limit is arbitrary—not because it is a precautionary limit. Moreover, there is a new depositional model, which is a vast improvement on the old model; as a result, the 2,500 tonne limit has now been removed and we are seeing more interest in much larger farms.

John Aitchison: I also note that there has been an application for a 3,500 tonne farm.

The Convener: We will now look at the sea lice data in greater detail. I call Claudia Beamish.

Claudia Beamish (South Scotland) (Lab): Good morning. I welcome David Sandison's statement about the sea lice data. You will, no doubt, recall that, during the passage of the Aquaculture and Fisheries (Scotland) Bill, I lodged an amendment on farm-by-farm reporting although, in the end, that proposal did not become law.

For the record, can you give us some more detail about the reporting of real-time data and why there would be any delay in that respect? Do you or, indeed, other panel members see any reason why that reporting should not be made a statutory obligation given that not all salmon farmers are members of your organisation? Finally, Is there an opportunity to ensure that wild salmon are protected, given that, as I understand it, only salmon in the cages would be protected at the moment? I realise that that question might be broader than you can answer.

09:45

David Sandison: You have asked me quite a lot there. Let us look again at what we mean when we say that we will publish everything, and I will explain or paint a picture of what actually happens on farms.

Every salmon farm in Scotland counts its sea lice levels weekly, and that has to be resourced and properly recorded. The information has to be gathered at company level then passed on and aggregated. There is an inevitability that that will take more than a week. Subject to agreement between all parties, including the regulators, we anticipate that we will look at the information farm by farm, probably on a month-by-month basis. Clearly, there will be some lagging in the timescale for presenting that information publicly.

It is really difficult for me, at this stage, to say exactly what that information will look like, because the discussion is on-going and, as I have said, the current work on the 10-year fish health framework will be where the detail of that is thrashed out. I am sure that we will hear more about it, probably within the next two months, because that group is due to report in late spring.

Claudia Beamish: For the data to be useful, including for research purposes, do you recognise the importance of its immediacy and of having the data on a farm-by farm basis? I ask that question

in view of evidence that was given to us in the scientific report about the differences between localities, with sea lochs, tides and a range of issues to consider.

David Sandison: I will try to say something useful about that and break it down a little bit. There is clearly an interest in having data as soon as possible, but there needs to be some sense of what we are trying to achieve, what we are going to do with the data and what we will gain from having the data available.

Getting data in snapshots is, frankly, of no use to anybody. The data needs to be collected in a way that means that it can be used to meet longer-term objectives, enhance research and move the debate forward. We will openly debate how quickly and honestly we can do that, but, frankly, we are prepared to do that and nothing will be held back. We hope that the data will be used for the benefit of the wider industry.

Claudia Beamish: Can you comment on the statutory obligation to report? Should it be voluntary, in your view?

David Sandison: We have no particular view about that. I think that we would be doing exactly the same thing, but we would like to be ahead of any regulation as much as we possibly could be. We have no problem with reporting. If statute is required to back that up, we have experience of that already in the way that the Aquaculture and Fisheries (Scotland) Act 2013 acts as a backstop for our code of best practice.

Claudia Beamish: Could other panel members comment on the issue from their perspectives?

Dr Collin: I believe that there should be a statutory requirement to provide sea lice data. The sooner and more regularly the data can be provided, the better. If we are trying to identify rapid spikes in sea lice numbers, we want to do that as quickly as possible and act as quickly as possible to solve the problem. The process could be improved by identifying a clear, standardised methodology for collecting and presenting sea lice data so that it could be easily accessed and analysed.

John Aitchison: Yes, of course, it should be a statutory obligation. Openness is good; secrecy is poison in these discussions. Communities such as mine do not trust the results if there is no openness. The process—not just the figures that are collected but what is done with them and the whole explanatory process—needs to be clear.

The fish health organisation that is part of Marine Scotland is focused only on the health of farmed fish, as you know, and wild fish are not protected by it. The figures are used for protecting only the fish in the cages and there is no enforcement. The example that was given of a farm in Shetland that has 20 lice per fish is Score Holms fish farm. The only enforcement that has been served was served there, and all that Marine Scotland did was say, "The fish are going to be harvested in October anyway, so you can just keep them with that level of infection until October." There was no protection, no precautionary principle and nothing to help the wild fish there—nobody does that. No agency is responsible for that except the Scottish Environment Protection Agency, which still has that responsibility on its books and should be using biomass reduction to protect wild fish.

Claudia Beamish: How do you see that work going forward? Do you have a view on that?

John Aitchison: It is critical.

Claudia Beamish: Could you provide some detail on that?

John Aitchison: At the moment, the councils do it—it is part of the planning process—but they say that they get inadequate data from Marine Scotland, which does not give advice on the population impacts. The councils do not have enough data about where the sensitive sites are, because nothing is known about migration routes, for example. Argyll and Bute Council has pointed that out in its submission to the committee. The councils do not have the sensitivity information or the farm-by-farm data. In the planning process, they cannot look at more than one farm at a time, so they cannot consider the cumulative effect.

Loch Fyne has nine fish farms. If an application for a new one is made, Argyll and Bute Council will look only at that proposal, which means that it cannot see what the consequences are. There are farm management agreements, but they apply only to one farm, and the fact that planning permission is permanent means that the council cannot go back and do anything about it. The council does not carry out monitoring—it does not have the resources to do so—and there is no enforcement. Therefore, the situation is a shambles.

At the moment, there is no body to represent the wild fish. There needs to be an agency that could take in the data, analyse it, decide what to do and take rapid enforcement action. In the Faroes, for example, they cull all the fish when there are more than three adult female lice per fish.

Claudia Beamish: Before the convener brings in other members, I would like to ask whether John Aitchison or the other witnesses have a view on the recommendation by the aquaculture consenting review that the consideration of potential wild salmonid impacts be removed from planning and instead be considered in a separate and more appropriate regulatory process.

John Aitchison: Some careful thought—more than can be provided in this setting—needs to be given to that suggestion. It is true that the planning process is no good but, crucially, the people who are affected by the decision-making process get access to it only through the planning process. There is no other way to comment, other than by writing to SEPA at the controlled activities regulations stage.

David Sandison: In the industry's opinion, management of sea lice has in general improved vastly over the past 15 years. We have many management tools at our disposal.

In response to the comments that have been made, I would like to say that the industry is working exceptionally hard to manage down sea lice levels at all farm sites. Inevitably, there is information out there that shows that that is not always successful. We must always do better to get the numbers down; it is in our best interests to do so, and we do so every day. Huge resources are thrown at the sea lice management regime and we have had great success.

If we compare the situation in 2002 with the position now, we see that the industry has developed significantly; companies are much better resourced, better managed and better co-ordinated. A system of area co-ordination to deal with problems is in play to a much greater extent than was the case 15 years ago. When we had a significant number of small independent farms, it was not possible to get that level of co-ordination. Now, we can bring in all the tools that we need to deal with any problem that arises.

If we face a problem on a farm, we usually do everything to try to resolve it. I believe that there is nothing that any other agency could do that the industry is not already trying to do. If we work closely with our regulators and with our fish health inspectorate people, we can come to a point at which we can decide what is best for the livestock on a farm. Everything is done under veterinary supervision. We have the tools to do the job.

Claudia Beamish: Do you have any comments on the sea lice trigger levels that are used in the current reporting mechanism?

David Sandison: We still work to a national treatment strategy. We try to manage down adult sea lice numbers to no more than one per fish. There is a lot of information out there that shows that the level is higher than one per fish. That level is the trigger for us to instigate action to bring the level down. That does not mean that we do not go above it; it is the trigger for us to take action. There is a difference between that and having some sort of bar that we are not supposed to go above.

Under the legislation, we are required to report to Marine Scotland. We report at a higher level, because action needs to take place at a higher level when it is clear that there has been a failure.

Stewart Stevenson (Banffshire and Buchan Coast) (SNP): I want to go back to John Aitchison's statement that the planning system is not allowed to take account of the cumulative effect of fish farms. Every part of the planning system that I am aware of is required to take account of cumulative effect, whether in relation to wind turbines, housing or whatever. I invite Mr Aitchison to point me to the law or regulation that prevents cumulative effect being considered in planning decisions in relation to fish farming.

John Aitchison: Yes. I will read what Argyll and Bute Council said about the matter in its response—

Stewart Stevenson: I am sorry, but I am looking for the law, not what individual councils choose to do. They often restrict themselves in ways that are not required by law—I am not referring to Argyll and Bute Council in particular when I say that—but I am interested in where the legal basis is.

John Aitchison: I, too, am interested in that. You should speak to Argyll and Bute Council if you think that it is not obliged to do what it is doing. Would not it be sensible for the council to be informed about that?

Stewart Stevenson: Forgive me, but you said that there is a legal barrier, and I am interested in what it is.

John Aitchison: No, I did not say that. I said that the council said that an environmental management plan

"can only relate to specific measures on that farm site"

and cannot affect

"the management of other sites in the same farm management area".

There could be

"ten active farms with ... a single farm being managed via an EMP. This farm could be following the EMP but sea lice levels are high because the farm is affected by the management of other farms which are not managed via an EMP."

Stewart Stevenson: Convener, perhaps we should write to Argyll and Bute Council to find out whether it is, in effect, failing to consider cumulative effect, because I am a bit suspicious. I absolutely accept that Mr Aitchison was quoting the council in good faith, and I do not like the sound of what I have heard.

The Convener: It is certainly something that is worth clarifying.

David Sandison: I do not have a comment specifically on the legal position, but the committee will talk to a Highland Council planning official later today, so perhaps there will be an opportunity to ask questions at that point.

In relation to environmental management plans—which are quite new to our parlance—we already have area management plans for fish farms. Collectively, as an industry, we stock wide areas synchronously and we fallow wide areas synchronously. We think about the overall zone that is affected by our activities.

John Scott (Ayr) (Con): Good morning, gentleman. Thank you for coming to give evidence.

I want to broaden the conversation a little. Last week, we heard that the top three environmental impacts of salmon farming are the impact on the future of the feed supply, the long-term chemical effects through diffuse pollution and the impact on the wild salmon population. We will move on from talking about the sea lice problem to the potential long-term chemical effects, as you see them, of the pollution that might result from emamectin dispersion.

David Sandison: The consented licence products that are used in Scotland are specifically formulated and licensed for use in a marine environment. We monitor their use and have to report regularly to the Scottish Environment Protection Agency on every treatment that takes place. There are sampling protocols for examining the sediment and the benthos to see the net effect of our operations.

There is clearly already some debate about whether that footprint tells us everything that we need to know or whether it is the correct one to use. Opening up the system so that monitoring can happen at whatever level is required is absolutely fine. Some work is going on that looks at whether the fate of emamectin benzoate, which John Scott specifically mentioned, is as we understand it to be. Research is going on to clarify further some of the assumptions about that, and we await and will welcome the research findings. We live on the back of the evidence on whether the impact of salmon fishing is acceptable, and we have a proper regulatory system to control it.

Dr Collin: The amount of chemicals, in particular emamectin benzoate, that are used is obviously of concern. SEPA's recent reduction of use of emamectin highlights how little we know about its impact, particularly at low concentrations.

At the moment, assessments focus on the benthic environment surrounding a farm, but we know that emamectin can impact on some species at low concentrations. The impact of emamectin could be much larger; its footprint could be much larger than the size of the currently monitored areas.

10:00

John Aitchison: The chemicals are being used so much because sea lice have developed resistance to them. That is the main problem. All the chemicals need to be reviewed. The SAMS report refers to the levels that have been set for chemicals and their widespread effects. They can spread over 8km; if you put azamethiphos, for example, into the sea, it can produce an 8km plume. The monitoring is inadequate. The PAMP 2—post-authorisation monitoring project 2—study found that statistical analysis could be done only in Shetland, because all the monitoring was disjointed and it did not match up; it could not be used to do a big analysis in other areas. The study discovered that crustacean numbers had been depressed by 60 per cent much further away from fish farms where emamectin was being used than SEPA's modelling allows for. The SAMS report says that there is no understanding of the long-term low-level widespread impact of such chemicals.

An internal document from SEPA that I got through a freedom of information request states:

> "Fish farming is unique in that it is a sector which is allowed to discharge substantial quantities of biocides, some of them Priority Substances in terms of the Water Framework Directive and all at least List II substances in terms of the old EU 'Dangerous Substances Directive' ... the waters in which salmon farming is practiced are usually the same waters in which Scotland's valuable crustacean fisheries are located ... it is not tenable for SEPA to adopt a position where commercial shellfish species are impacted by the day-to-day activities of fish farms"

when—I will paraphrase here—SEPA has knowingly authorised those activities under the Water Environment (Controlled Activities) (Scotland) Regulations 2011.

Donald Cameron (Highlands and Islands) (Con): I refer to my register of interests in relation to fish farming and fishing. I want to continue this line of questioning on the effect of discharge of medicines and chemicals. I will start with a general question on the system of monitoring. It seems to me that SEPA takes a role at the start of the process in relation to the EQS and the issuing of the licence. Do you have any observations on the monitoring that happens thereafter?

David Sandison: The consent from SEPA states quite clearly that any medicinal treatment must take place under veterinary control. When you decide that you need to treat your fish, you have to get the advice of your veterinary adviser or practitioner. Everything that is done in treatment from then on in requires that veterinary supervision. That is a fundamental.

As well as that, SEPA lays down monitoring requirements within a consent. SEPA must get quarterly, reports that show what has been done on a site. Fish farmers then have to produce sediment benthos samples annually and biannually. Those are analysed to assess compliance with the consent and to determine whether SEPA needs to take action to alter the terms of it. It is a well-trodden path. There are absolutely acres of information out there about exactly how that has worked over the past 20 years. I do not think that there is any deficit in monitoring of activity.

Dr Collin: SEPA sets a limit based on the biomass of fish farmed at a site and does depositional modelling of the impact of the dispersion. If a farm operator uses less than that limit and is still able to control sea lice, does that mean that there is an adjustment of the limit on the amount of chemicals that the operator can use? Are adjustments made as a result of long-term monitoring? We are not clear on that process.

On monitoring of the benthic environment, there is monitoring of the amount of chemicals in the sediment but not necessarily of which species are found in the sediments, how the species composition has changed over time because of use of chemicals, or how the amounts of chemicals that have been used have impacted on the benthic community.

John Aitchison: SEPA modelled that with a computer model. I think that members all have a copy of my submission, which shows a map of Dounie, in the Sound of Jura, where I live. The purple area shows the existing model that SEPA used to model where the waste—the solids and the emamectin benzoate—will go. The model suggested that it is all underneath the farm, but 99 per cent is swept away—as soon as it leaves the black square on the map the model does not care where it goes; it is gone, as far as the model is concerned.

SEPA then did a test with the new model, which showed that waste goes elsewhere. Not all of it goes elsewhere, but 86 per cent leaves that square and the model still does not care where it goes. The amount that goes into the red area on the map is a kilogram of waste per square metre per year, with the emamectin bound in—it is excreted by the fish, so it sits on the seabed.

I am saying that the old model that is still in use, and has been used for 15 years to do all the pollution permissions under the controlled activities regulations, is inadequate. It is a flawed model that ignores the fact that the sea bed slopes. The reason why the red and purple areas on the map are different is that the sea bed slopes there, but the old model does not account for that. The industry is expanding into places where there are fast currents, steeper slopes and more complicated bathymetry, so the current model is inadequate.

There is a new model that is better, but it still exports 86 per cent of waste from the site: that waste is then ignored, as if it had gone away. It has not gone away. It has gone somewhere else: it settles up the coast. Another fish farm 1km away will get that 86 per cent of the waste from the fish farm that we are looking at. That impact is not in the model.

I just spoke to Anne Anderson from SEPA; she does consenting and compliance. We wrote to her in October. Apparently SEPA has replied—I have not seen the letter, but apparently it has been posted—saying that it will use the new model instead of the old one. However, the new model is opaque. It has not been peer reviewed and no one knows what assumptions are built into it. The new model should be publicly and independently scrutinised, because the assumptions in computer models determine outcomes, and the model has the enabling of industry expansion as one of its goals. That is not a good basis for setting levels for anything, and—

The Convener: I am sorry to interrupt, but I must let some committee members in.

Mark Ruskell: Does the panel think that there is a case for banning emamectin, or should we simply reduce its use? I assume that not even the industry wants to increase its use, but I might be wrong.

John Aitchison: That is out for consultation at the moment; the industry is consulting. A ban was proposed, but SEPA withdrew the proposal, apparently under pressure from the industry, through the Government. That is what is in the press—in *The Herald*—and it makes us distrustful.

A temporary new level for emamectin has been set, which applies only inside marine protected areas, but two fish farms, at Loch Duich and Rum, have just been allowed without that condition, although they are in MPAs. So the new level is not being applied, even though a precautionary thing was applied in one instance.

Donald Cameron: I have a very general question. We have concentrated a lot on fish farming in the sea, and the report is primarily focused on that, but a lot of fish farming happens in freshwater lochs. Time is short, but in the light of the report, do you have observations on the environmental impact of fish farming in fresh water?

Dr Collin: There is certainly a concern about farming in fresh water to do with escapes of juveniles into the river system and their integration

and eventual interbreeding with wild populations of salmon. That is one of the main concerns for us.

The Convener: Mr Sandison, do you want to respond to the question?

David Sandison: I will do that, and then go back to Mark Ruskell's question, if I may.

We have had significant freshwater smolt production for some time, and it has been well monitored. We see no fundamental issues with freshwater farming, but in the future the industry's general move will be towards recirculating aquaculture systems and towards systems that control smolt production in a different way. That is not a wholesale move away from what we currently do; we will do that as well as doing what we currently do. We see no fundamental problem with how the freshwater element of the business operates.

I acknowledge what Sam Collin said about the potential impact of escapes, but there is no solid evidence of a problem. We acknowledge that it can happen, and there is an escapes issue, but as far as we are aware, no actual impact has been demonstrated.

Again, science is important. We need to work on that to find out whether we can move on. At the moment, we are relatively comfortable with what we do in freshwater and are complying with the river basin management planning.

To return to Mark Ruskell's hypothesis about emamectin, let us make it absolutely clear that we use very few licensed medicines. I state clearly that our medicine usage is on the decline. We are moving away from reliance on chemicals and towards a wider suite of approaches to controlling sea lice. We are using biological controls that use cleaner fish—wrasse and lumpfish—and we are investing significantly in physical removal of parasites.

Many measures that are currently being used in the industry have to be perfected and we need to see the results of using them along with chemical treatments. We believe that, in time, we will not have to rely on chemicals. It is not a case of the industry needing to grow and use more chemicals. We have to widen the suite of tools that are available for us to manage the problem.

The Convener: With respect, Mr Sandison, those of us who lived through the passage of the Aquaculture and Fisheries (Scotland) Act 2013 were told then that wrasse would be the answer. Two, three and four years later, we still had a significant sea lice problem. The answer always seems to be that we will get there tomorrow.

David Sandison: The cleaner-fish story is an extremely good news story: there are lots of really positive outcomes from use of cleaner fish in our farms. I dispute the idea that sea lice are out of control. From the statistics, we can see that they are not. In fact, numbers are declining rather than increasing.

Mark Ruskell: If I take your response to that question at face value, and if you have other tools in the box to control sea lice, why do you not support a ban on use of emamectin?

David Sandison: I do not believe that the case has been proven for emamectin having the alleged impact. We need to wait until the studies that are currently under way are completed and then take a view as to whether peer-reviewed evidence gives us the information that is required to make such a decision. That decision is not appropriate at this time. This is another example of our taking the precautionary approach: we have already agreed with the regulator that we should reduce use of emamectin.

The Convener: We need to move on. The two other headlines that were identified last week were the sustainability of feed supplies and the effect on the wild populations.

John Scott: On the future sustainability of feed supply, to cut to the chase, how can the industry's expansion carry on given the lack of availability of omega 3?

David Sandison: We could spend quite a lot of time on that question, but I will try to say something that will be helpful to the committee.

On the future outlook for our food supply, we do not see any issue with our ambitions for growth, because we have moved away from complete reliance on marine ingredients towards a mix of marine and plant or vegetable ingredients. There is not really an issue with fishmeal. We are already able to substitute to the correct level to maintain the right level of the important omega 3 elements that we need to retain in the diet. As a result, we do not see any issues. We will have a pressure on the fish oil element of what we put into the diet. We need to have sound solutions to that. However, we already have significant developments in relation to algal oils and other substitutes from plant and vegetable oils that provide the omega 3 that we need for the diet.

There is a finite resource of marine oils globally. Our industry is best placed to use as much of that marine oil as it possibly can. That is our strategy for the future. We will continue to use the appropriate level of marine oil. We regard ourselves as a prime customer for such a resource rather than it being put into other products that, to be frank, perhaps do not provide the same protein package and healthy foodstuff that we provide.

Dr Collin: It is important to clarify that the resources for salmon farm feed are already

stretched, particularly marine resources. We are talking about fish oils. Just last week, it was mentioned that the anchoveta population in South America is already at maximum sustainable yield. That is the main source of fish oils for the industry. That is a limiting factor if we want to maintain the omega 3 values.

10:15

Secondly, one thing that is not really considered when talking about sustainable feed is the high level of mortality rates in the industry at the moment. For example, 10 million fish died in 2016; we have to recognise that a lot of the feed went into feeding those 10 million fish, which eventually went to landfill, not to market. When we are looking at conversion rates, we need to look at the feed that is used and the number of fish that go to market rather than the number of fish that are being fed.

Finally, if we are moving towards the use of cleaner fish to control sea lice, they are another farmed fish, essentially, that will need a supplementary food source, which also needs to be factored into the requirements.

John Scott: They do not live on sea lice alone.

Dr Collin: Not alone. They feed on them, but that is not the only thing that they eat and they require supplementary feed as well.

John Scott: Thanks for that information.

John Aitchison: Basically, it is not sustainable and the industry says that it is. The industry ought not to be allowed to say that it is sustainable when the food that the fish are fed is not sustainable. Sam Collin is quite right about mortality—the fish that die are not included in the figures for the outcome of fish produced compared with the input of fish that are fed to the fish.

John Scott: I thought that the scientists have said that we are at the limit of maximum sustainable yield and that alternatives will need to be found, but you are saying that that is not correct?

John Aitchison: Yes, that is right. For one thing, we are planning to double the capacity. If we are at the biomass limit for sustainable fisheries for anchovies, for instance, where is that going to come from? That is not sustainable if we are going to go into new fisheries, including krill, for instance, which is the next thing on the list of foods containing omega 2 that you can feed to salmon.

The other thing is that if you feed plant proteins to fish, you have to justify where they come from. If you are feeding fish mainly soya, which is what is fed to them, primarily, much of it comes from areas where the forests have been felled in order to grow it. Then there is the question of whether you are taking agricultural land out of production for producing plant food that people could eat in order to feed it to fish to less efficiently convert it into food that people can eat.

David Sandison: We can certainly debate sustainability long and hard. However, let us just get some facts straight: the fishmeal and fish oils that are used in feedstuffs by the Scottish salmon farming industry are 100 per cent sourced from sustainable sources that are certified either by the IFFO responsible fishing scheme or by the Marine Stewardship Council. We acknowledge, as I have already stated, that there is a finite resource that we need to manage better.

We are not going to magically find more fish and we are certainly not going to be looking for species that are not appropriate to our feeding regime. Yes, we have to find alternatives and yes, we have to make sure that we properly manage plant and vegetable alternatives. However, we do not see any problem in so doing.

Stewart Stevenson: This is a question for Mr Sandison. It has been suggested to me that retailers are laying down minimum quantities of fish-based content to feed that might be different from lower levels that the industry believes it could undertake. To what extent are retailers influencing what salmon are being fed in this domain?

David Sandison: It is a circular discussion. Retailers reflect what consumers are telling them and consumer panels and so on, certainly in the United Kingdom, will say that they prefer to know that a farmed fish is fed a marine diet or what is substantially a marine diet. Our preference is to maintain a higher level of marine oil in our fish than is found in fish in other countries. For instance, if you buy a Norwegian or a Chilean salmon fillet, it will have a lower level of marine oils in it than Scottish salmon does. That might well be a good point of difference for us to maintain. I see no reason why we should not be the prime customer for the available marine ingredients that are there for that purpose. That is the best use of that product.

The Convener: Let us move this on to look at the impacts on wild populations.

Richard Lyle (Uddingston and Bellshill) (SNP): I want to turn to escapees from fish farms and the potential effects on wild populations. If I was a farmer, I would take every step to increase my production through environmental means. If I was a salmon producer, I would take every step to ensure no product loss, yet we are told that thousands of salmon get out of pens. I see you nodding your head, Mr Sandison. Why are we losing thousands? If you want to increase

production and you want to ensure that you grow the industry, why are you allowing thousands of salmon to disappear from pens?

David Sandison: You will not be surprised to hear me say that the first thing that we are going to do is to try to make sure that we do not have any escaped fish. It is the product that we want to get to market, so every effort is made to not have escaped fish.

The industry has worked with regulators to produce what is known as the Scottish technical standard. It is a standard to try to up the game and keep driving down the level of escapes in the industry. I know that it is difficult when we are talking about quite large numbers to get that into perspective but we have about 65 million salmon in operational sites around Scotland at any given time and I think that the literature that the SAMS report has provided shows that the average number of escaped fish per year is 146,000. I cannot quite do the sums, but it is quite a low percentage. I am not trying to diminish the issue of escaped fish because, clearly, even 146,000 on average per annum is an unacceptable level and the industry's intention is to do everything possible to drive that figure down to zero.

Richard Lyle: Does the panel believe that this issue of escaped fish is avoidable or unavoidable in open water? What can be done? Mr Sandison says that 146,000 is negligible—

David Sandison: No, I did not say that.

Richard Lyle: I would say that 146,000 is not negligible. As far as I am concerned, even one escape is enough.

David Sandison: I did not say that it was negligible.

Another point is that the number of those escaped fish that might survive in the wild is very small. We do not believe that we have an actual problem in terms of—

Richard Lyle: Do you have any proof of that? Any data about that? I do not think so.

David Sandison: We do not have hard numbers, but we know that fishermen catch a lot of them and seals eat a lot of them.

Richard Lyle: I have another question, but other panel members may want to respond to my first one.

John Aitchison: Do seals eat most of the fish that escape? The SAMS report is very clear about the number of escaped fish that go into rivers and the effect that that has. The report says that there is

"unequivocal evidence that interbreeding and genetic mixing of farm salmon with wild populations can have impacts on the life-history of wild populations, which can negatively influence the dynamics and viability of populations."

We are looking at what is happening at a population level. That is the one criterion that is difficult to prove normally on something as nomadic as a wild salmon but there is proof about population impact—escapes in Norway are the biggest reason, even above sea lice, for the harm to wild fish.

It is unacceptable that the equivalent of half the Scottish population of wild salmon is allowed to escape every year. In addition, that number is an underestimate, because there is a drip escape through damaged nets. It is just nonsense to say that it makes no difference.

Richard Lyle: So it is your contention that genetic mix is happening.

John Aitchison: It is definitive—it says so in the SAMS report.

Richard Lyle: What action should the industry take now and consider taking in the future to prevent escapes, and to prevent introgression when escapes occur?

John Aitchison: There must be containment. The fish must be contained in tanks not in nets, because nets are vulnerable to damage and loss.

Dr Collin: Certainly having stricter protocols on how fish are managed to try to account for human error would be important. In terms of the equipment that is being used, much stronger netting would be an easier way to ensure that fewer fish escape. Also, if you can contain fish and create a solid barrier between the farmed and wild fish, that would cut down escapes a lot.

Richard Lyle: Mr Sandison, before I finish, would you agree that you have to do better?

David Sandison: Yes, we would agree that we have to do better. I will refer again to the Scottish technical standard, which covers quite a lot of what the gentleman is asking about. I will also say that we need to continually innovate in cage design. We are moving into more robust, exposed waters. As we do so, we must have the technology and the sturdiness of cage structures to do that. We are not going to go into more exposed areas unless we are absolutely sure that we have the right kit to do so.

Again, I am not in any way diminishing the numbers or trying to make a case that we can live with that level of escaped fish. I think that the numbers as they are at the moment can be driven down further, and our industry is intent on doing so.

Richard Lyle: Thank you.

The Convener: Before I bring in Alex Rowley, Mr Sandison, there is something a little confusing here. In November, the Scottish Salmon Producers Organisation produced a report called "Sustainable Scottish Salmon"—I stress the word "sustainable". In the foreword of the report, the cabinet secretary makes the point that he is determined to see the growth of the sector achieved

"without detriment to our wider environment"

but not once anywhere else in the report is there a reference to environmental responsibility and sustainable practices. Is there not a disconnect between what we are hearing today and what is in the report?

David Sandison: I do not think that there is a disconnect in the minds of anybody in our industry in that regard. Every policy that is set by the Scottish Government and by the regulatory agencies that work on behalf of the Government clearly defines the balance that is needed between the industry's economic objectives and the need to achieve those in a manner that is in tune with the environment. It is absolutely written into the script as far as we are concerned. We work in the natural environment every day, 365 days a year. We can probably be seen as being in a good place to be guardians of the environment from that point of view and we can be of assistance to agencies in many ways in terms of what is going on out in the natural world.

Alex Rowley (Mid Scotland and Fife) (Lab): Richard Lyle asked why thousands of fish are lost every year through escapes, but I think that a lot of the public are starting to wake up and ask why millions of fish are being lost every year to disease. The Marine Scotland science fish health inspectorate stated:

"Throughout the 1990s and 2000s there was around 20% mortality of farmed salmon throughout the production cycle. This seems to have increased from 2014 to the present day."

What level of mortality is there throughout the production process currently? What are the main causes for that level of mortality and how does the industry deal with the massive number of dead fish?

David Sandison: First, on the historical and current positions, the numbers are the numbers as reported. I am not able to give you a set of more current numbers because, until we have the reports finalised and in the hands of the fish health inspectors, we can only speculate about them.

We would look to a normal farming operation to have a lower level of mortality than the average that you have described; we would not accept that that is a norm. We have had a couple of bad years in which we have had significant issues on top of normal operating issues, mainly caused by gill health challenges. The gill health challenges in themselves have probably led to increased mortality in some cases, but they have also led to other problems in relation to the need for those fish to be cared for; the treatments are more difficult because of the gill health challenges. We have a complex set of reasons why mortality has increased.

You asked how we deal with that mortality level and attention has been focused on the fact that large volumes of fish have to be transported from remote areas to central sites to be disposed of. Unfortunately, that is a fact of life and it is one that we wish to see solid, biosecure control over. We do not want to see any problems in that regard. That is the disposal route that is available to us. There is a set of waste regulations in Scotland that we have to comply with for the proper disposal of fallen stock. The same thing applies across a range of different livestock sectors. Fallen stock have to be dealt with by fish farmers in the same way as they would be in any other livestock production. We have to dispose of those fish in a biosecure manner to an approved facility.

Dr Collin: I want to pick up on the figures that David Sandison mentioned. He said that there are about 65 million farmed salmon in Scotland and we know that there were 10 million fish mortalities in 2016. That suggests that the mortality rate is still between 10 and 15 per cent, which is clearly unacceptable. I want to clarify that.

10:30

John Aitchison: The rate is sometimes higher. Colonsay lost 150,000 fish last summer, so the mortality rate is sometimes up to 40 per cent. At the previous meeting, somebody asked what the normal mortality rates are in farms. For chickens, it is about 4 to 8 per cent. People care about that sort of thing—they watched "The One Show" and saw trucks coming off Lewis with 160,000 dead fish, dripping waste on to the road. People watch television programmes such as "Blue Planet" and they care about the sea. They demonstrate that by joining networks of groups such as the one that I belong to. We should not think of the issue in isolation and one that applies only to fish farming; it applies to all the people in Scotland. We care about the sea and rely on it being clean for our jobs—we mind.

The Convener: Do those mortality figures not suggest that you are getting the approach wrong somewhere along the line? That is a huge mortality rate in all its guises. Does that not suggest that the industry has a real problem?

David Sandison: I will not try to diminish the scale of the challenge that we face, but we need to

understand the factors that explain those high mortality rates. I have mentioned gill health, which is caused by changes in the environment, involving jellyfish and algal bloom issues and planktonic movement, which affect our fish. We must be better at preparing for that eventuality and be in the best place to try to negate those changes. The trouble is that when we are affected, we then have to take management decisions to deal with the problem. Sometimes, that will have a worse effect on us than at other times. We have had a couple of particularly bad years but that is not the whole picture—mortality rates fluctuate quite a lot. Mortality data shows that the rate goes up and down.

Edward Mountain (Highlands and Islands) (Con): I declare an interest in that I have a wild fishery.

One of the mortality factors is gill disease. The SAMS report identifies that that factor is caused by increasing temperatures; a lot of cases happen in summer months. That is borne out by the figures that I have seen. Do you think that mortality rates will decrease? Is the temperature increase that we have seen just a passing thing that will not be a problem in the future?

One of the ways to combat gill disease is to harvest fish earlier. Might mortality be masked by early harvesting? Will you comment on those questions so that I can understand the issue a bit better, please?

David Sandison: I think you are asking whether the forward trajectory is that we will have more of the same. There has definitely been a difference in sea temperature over the past 15 years, but it is extremely difficult for us to fully understand the implications of that. We need more science and evidence to back up what the impacts are of that type of change in the marine environment. We will work very closely with anybody who wishes to help us to better understand that. I cannot really say more than that on whether we think that the situation will continue in the future.

We are already in a position to put into play some solutions for dealing with the challenge of gill health. We are investing heavily in our ability to treat fish with fresh water in well boats or other contained units, so that we can do away with most of the gill problems that affect those fish. Washing gills with fresh water and putting fish back into the cages is a very good way of dealing with part of the problem. We need to see how that work progresses and whether it helps us overcome the difficulty. Ultimately, when gill health deteriorates beyond the point at which it is sensible to keep those fish in the sea, we will harvest those fish out early, as that is in their best interest.

Edward Mountain: When fish are treated they experience stress, and the more stress that they are put under, the more likely they are to die. You are saying that when you identify a gill problem that you cannot treat, you will harvest the fish and put them into the food chain through normal production methods.

David Sandison: Yes, absolutely. They are not diseased fish. There are no public health implications in relation to the status of the fish. We need to make that absolutely clear. There is no issue about the fish that come through to the market from that sort of outcome.

John Aitchison: It seems to me—and this is a general point—that we need to ask why we would expand an industry that has all these problems, without fixing the problems first. Is that not fundamental? These are big problems of illness and so on. Why do we not fix them before we expand? One way of fixing them is to separate the wild fish from the farmed fish by enclosing the farmed fish in containers.

Dr Collin: I should point out that although the diseases that we are talking about exist naturally in the environment, it is the density at which the fish are farmed that causes outbreaks. If we increase the size and number of farms, the number of outbreaks will only increase. If we factor in the rise in sea temperatures, which will increase the rate of outbreaks, we see that the problem is clearly not going away soon.

Mark Ruskell: In answer to my question about the mortality rate, David Sandison confirmed that every farm in Scotland will produce its own mortality data, with the causes of mortality broken down by disease. Is that correct? That is what you said.

David Sandison: We will have a report, which will be a commentary that highlights where a disease issue is at play. There will be a percentage on mortality, and if the percentage is not normal we will explain the reason for the mortality.

Mark Ruskell: Are you now saying that gill disease is the major cause of mortality? Is that correct?

David Sandison: No.

Mark Ruskell: I am trying to get some clarity about the picture. You focused on a particular disease. I am trying to work out whether that disease is the main reason why the mortality rate has doubled in three years. Is gill disease the main reason?

David Sandison: No, not in its own right—

Mark Ruskell: What is the reason?

David Sandison: As far as we are concerned, if we look at the overall picture, we see that fish health in Scotland is very good indeed. We have a situation in which we are impacted by environmental conditions that affect the fish from time to time. That is potentially compounded by complex gill issues, which make the fish more susceptible to other problems, including the effects of parasites. We then have a complex situation in which fish have less ability to be optimal—if you like—in terms of their performance, so we have to make choices about what we do about that.

From time to time, algal/jellyfish issues are the main reason why large fish kills happen. If we look at the statistics, we see that a lot of the mortality is a result of natural conditions that lead to the death of fish.

Alex Rowley: Mr Sandison, you said earlier that fish health is "the core of our business". When 20 to 25 per cent of fish are dying of disease, you must surely say that there is a problem at the core of your business.

Do you not agree that, rather than expand the business, you have to start looking at the problems? I am not getting the sense that there is a clear understanding of the issues. We talked about the collection of data. You just said that data will be collected farm by farm, but you have not suggested that the industry knows the detail about why millions upon millions of fish are dying from disease. What plans are in place to establish the causes of those deaths?

Does the rest of the panel agree that we should halt the growth of the industry until we get answers on a significant and serious problem for the industry, which seems almost to be being ignored? The approach seems to be, "Let's keep going and farm more and more; more and more fish will die but that won't matter because we will get more and more to the market." Surely that cannot be the way ahead.

David Sandison: Let me start with your suggestion that we are not doing anything about the issue. It is obvious that we need to get more information to this committee and others about what we are doing about it, because we are making significant efforts to address the challenges, and we are overcoming the challenges significantly. I do not believe for one minute that we are not taking the issue seriously.

As for whether we believe that we can grow, we have set ourselves ambitious targets. Any industry that is successful will try to be ambitious in setting its targets and will set out clear plans for achieving them. However, we would be first to say that we will not achieve ours unless we overcome the challenges that we have faced in recent times. In Scotland, we have a consenting regime that is extremely robust. Any growth that we get will be in line with that regime, through which we have to go to get that growth in place. We will not achieve it unless we can keep our fish in good health.

I repeat that fish health is our absolute priority. We fully understand what is happening with the fish in our care. We understand the complex variety of reasons why the figure for mortality, as it builds up to a cumulative total, is difficult to talk about. We can talk about how we break it down, but I do not think that that will help us. We will just have to make an improvement across the board on that. We fully understand what is going on in our farms and we think that we have the tools to deal with the challenges. We need to work in partnership with the Government, regulators and others to make sure that we can all contribute to that, because we do not necessarily have all the answers. We welcome help from others who might be experts in our field and who might assist us in that objective.

The Convener: Mr Sandison, let us get some quantification regarding your answer to Mr Rowley's question. You said earlier that you would work with anybody to develop the science as a sector. How much has the sector contributed financially to the development of science in the past few years and to what extent does it feel that it should contribute in the future if we are to develop a robust scientific base? What sort of sums of money is the sector putting in?

David Sandison: I am not going to give you one number, because I do not have one. However, perhaps I could offer some information that might be helpful.

If we look at what is happening in the sphere of research and development across the salmon industry, we can see that the number would be a very large one. That R and D will include cross-national work, because some work is as applicable in Scotland as it would be in, say, Norway or Canada. I do not see any problem with that. There is an international community and we invest in Europe-wide projects with regard to the necessary science and development understanding that we have—

The Convener: Can you be specific to Scotland? Last week, we heard that, in Norway, the sector contributes quite markedly to the development of science. What is the Scottish industry's specific contribution?

David Sandison: I would say that the answer to that question is between £15 million and £25 million per year, over the piece. However, as I have said, some of that will be for collaborative projects that have a European Union element that is not specific to Scotland.

The Convener: If you do not have the detail beyond that—and I understand that you may not have it today—perhaps you could write to us with information to flesh out that answer.

David Sandison: I am happy to take that away and try to give you more detail.

The Convener: Do others want come in on Mr Rowley's questions?

David Sandison: I will come back in on a supplementary, if I may.

John Aitchison: Mr Rowley, thank you. If I can summarise, it seems to me that having lots of sea lice weakens the fish, then disease and treatment kill them—as do some of the sea lice. Then the industry says, "That's okay—we can kill them early and sell them to people to eat" and it is okay to expand on that basis. Then, incidentally, the expansion plans become Government policy—apparently uncritically and without the Government thinking of such things until now, after the expansion has been approved. Then expansion depends on the consenting regime, but that does not include the impact on wild salmonids. In the reports, there is proof that there is a population effect. Wild salmonids are not represented by an agency of any type, so they are not in the process. The reports say that there is no data—as does Mr Sandison—and there is no public data about the effect of diseases, so everybody relies on the industry to sample such things itself. Meanwhile, we are asking what funding the industry puts into science. Why does the industry not put funding into independent monitoring, as happens in other places such as Alaska, where independent observers do the sampling in fisheries? It would make sense to separate the industry from the regulator. At the moment, they are really close and we do not trust that.

Dr Collin: I will comment on how the industry's and the Government's targets are calculated. From the industry, I have read a target of 300,000 tonnes to 400,000 tonnes by 2030. That is clearly based on the growth of the industry and public demand, but it does not take into account the capacity of the environment to farm that quantity of salmon.

We need to take a much more ecosystems-based approach to planning the industry's growth and development by figuring out where salmon farming can take place and what the carrying capacity of that environment is. The SAMS report talks a lot about the assimilative capacity. That should guide how to calculate the carrying capacity. We need that information to be able to set realistic growth targets that fall within environmental limits.

10:45

The Convener: Do you want to come back in on that briefly, Mr Sandison?

David Sandison: Actually, I want to add something to the previous answer about research, taking on board the fact that you are looking for more information.

In recent times, we have put significant effort into the Scottish Agriculture Innovation Centre, which is doing a significant body of work on some of the issues that we are dealing with in this meeting. The SAIC has calculated that every £1 of public funds that goes into its work is multiplied up to £6 through the impact of industry contributions. Those are not always direct cash contributions; it is the calculation of the industry contribution across all sectors.

John Scott: I declare an interest as a farmer. I well understand what you say, Mr Sandison, about the combination of diseases and challenges to fish having the cumulative effect of weakening them at different periods in their lives and different periods in cycles. Is there any research that you could let us have about the synergies of combined challenges working to cause deaths? That would be helpful. If that research does not exist, it should be done because it might go some way to explaining the deaths, which are probably all interconnected.

As a farmer, I am aware of the spread of disease subject to climate change, particularly in the land-based industries. I refer to diseases such as bluetongue and Schmallenberg disease, which are coming from Mediterranean temperatures and sub-Saharan Africa. Is amoebic gill disease attributable to a similar spread north because of temperature changes? I would welcome all the witnesses' views on that.

David Sandison: I am afraid that I am not in a position to give you a definitive answer about whether we have research evidence on the cumulative impact of different types of challenge and disease. However, I am happy to take that away and talk to the veterinary professionals. It might be that the committee could do with some input from the veterinary advisers about the potential scenarios.

There is definitely some effect from climate change. Amoebic gill disease spread from the southern hemisphere to the northern hemisphere and then started in Ireland and moved north, spreading throughout Scotland. There is something in the effect of climate change but we do not have enough science to demonstrate whether it is of any significance. We do not completely understand whether it is entirely related to that.

Dr Collin: The spread from the southern hemisphere to the northern hemisphere and the potential spread from Ireland northwards does not necessarily mean that it is a natural movement of the disease. It could also be caused by human transportation and malpractice. Biosecurity is a large issue in talking about the spread of disease.

On the effects of climate change, the reason that we get such outbreaks is, as I mentioned, the density at which the fish are farmed. Warming sea surface temperatures will only exacerbate that problem.

John Aitchison: There are also several mentions in the report of cleaner fish carrying diseases. Many of the wrasse are caught wild. They are breeding one tenth of the predicted 10 million that are needed. There are two examples of diseases in wrasse and one in lumpsuckers, and the Norwegian fish health report from last year says that they are really worried about lumpsucker diseases.

Some of the solutions are therefore not necessarily solutions; they might bring up other problems.

Stewart Stevenson: In the wild salmon population, age cohort by age cohort, are they more or less likely to die in the wild than they are in a farm? In other words, what is the baseline against which we measure?

John Aitchison: That is another area in which there is a lack of information. Should the Government have looked for that information sooner? You certainly need it before you plan expansion. One thing that is clear, however, is that the smolts going to sea are affected by sea lice more than the big fish that are coming back. The smolts that spend the longest time close to the shore are sea trout, which are a priority marine feature and should be protected by our rules. They spend the longest time close to the shore and get the highest level of sea lice, and they die. The ones that pass through—the salmon smolts—are generally getting more sea lice infections as they go north. The ones from the north-west corner of Scotland, and the ones facing west, such as in Lewis for example, get away quicker and have less exposure.

Stewart Stevenson: Are you saying that there is a difference between the east coast and the west coast, where there are farms? That is not the evidence that I have heard previously.

John Aitchison: That is not what I am saying, although it is true. I gave you all a graph about that. I was talking about sea lice, not disease, and the sea lice affect the fish that spend longest in coastal waters. We have generally ignored sea trout, and the SAMS report is very muddled about that. There are two salmonids: wild salmon and wild sea trout. The sea trout are protected and they are also impacted by the lice from salmon farming. We should protect sea trout—that is an obligation under biodiversity protection and the precautionary principle.

Stewart Stevenson: Mr Sandison, are they more likely to survive in the wild than they are in a farm, or vice versa?

David Sandison: The industry recognises that we will have some impact at all levels as a result of all our activity. We will have some impact on wild salmonids. I do not think that that impact is measured easily. However, measured against what happens out in the wild and the marine survival of wild salmonids, our impact is insignificant for a number of different reasons. We have to get that absolutely clear.

John Aitchison: No; that is not true.

Claudia Beamish: I have two questions and I would appreciate it if the panel could answer them briefly because we are short of time, although that does not reflect the importance of any of these issues.

I return to the transportation and disposal of dead fish. The witnesses might be aware that, in March 2017, there was an accident in which a transport lorry shed its load on the A9. Are the regulations, protocols and enforcement regimes clear and fit for purpose? If they are not, should they be changed? If they should, how?

As we are nearing the end of the meeting and other members want to come in, my second question is to seek a brief comment on the relationship between marine protected areas and fish farms; John Aitchison has already referred to that.

John Aitchison: I will start with your second question. Marine protected areas have a lower EQS—the allowable quantity of emamectin—but SEPA is not applying that at the moment. It has just approved two farms that do not have that limitation. It applies only to marine protected areas in which there is a sensitive feature.

The SAMS report says that there is hardly any information about which of the 81 priority marine features are sensitive to the chemicals, or to other impacts of salmon farms. Also, some of those marine protected features can swim. Where I live, flapper skate are critically endangered—they are as rare as rhinoceroses. The excuse that is used is that they can swim away. They are in the only place in the world where they are protected and they can apparently swim away.

It is not true that there is no impact on wild salmonids when they go to sea and come back again—that most of them die at sea. In Ireland, there is a 33 per cent difference. Up to 33 per cent

of salmonids that come back to spawn are limited, or reduced, by what happens to them as a result of sea lice.

I do not know the answer to the questions about infection and transportation.

Dr Collin: I will pick up on our concerns about marine protected areas. I agree with John Aitchison that the SAMS report does very little to address the impact on marine protected areas, particularly the network of nature conservation MPAs. That might be due to a lack of available resources, but it is something that we need to look into, particularly in light of the fact that the majority of predicted salmon farming growth will impact inshore nature conservation MPAs, many of which have protected features that are at direct risk from aquaculture activity.

I am not in a position to answer the question on the disposal of salmon mortalities.

David Sandison: I will answer Claudia Beamish's last question first, as others have done. Our industry recognises the suite of different MPA designations that have been placed throughout Scotland for a variety of reasons, whether it be for the protection of a specific species or not. We recognise that we have to live within that environment when we are thinking about where to site salmon farms, but we do not believe that that means that we cannot have a farm in or near an MPA—it depends on what exactly we are trying to protect. Again, we will work with all agencies to ensure that we are complying with the expectations surrounding a designation and we will also help with the management of a designation, where that is appropriate. I think that we are in a good place to do that in some cases. We therefore have no issues whatsoever with the regulatory conditions for protecting the marine environment—that is a given.

You asked about the appropriateness of the regulation around transport and specifically where it is working. I do not believe that I can comment on that. We understand the regulatory position and we do everything that we can in terms of biosecurity, but I cannot say that an accident will never happen. I do not know the details of the specific accident that Claudia Beamish mentioned and whether it led to a problem. However, if there is any evidence that we are not following proper biosecurity measures for the transport of waste or anything else, we want to know about it. We need to know about a problem before we can fix it.

Claudia Beamish: It is probably a question for the next panel.

David Sandison: It may well be.

Mark Ruskell: I turn to the issue of waste nutrients: faeces, food and all that stuff that is lining the sea bed. The new depositional zone regulation that is being consulted on would seem to allow the expansion of fish farms in more exposed locations while requiring a tightening up of the monitoring of nutrient waste. We heard evidence last week regarding the DZR approach from Dr Hughes, who said:

> "It is difficult to say whether the scientific evidence supports a move to DZR, because we do not know what such a move would mean."—[*Official representativeort, Environment, Climate Change and Land Reform Committee,* 30 January 2018; c 24.]

What do you see the impact of the DZR approach being?

David Sandison: One of the things that came out of last week's meeting—we read about it with great interest and had to think about it a wee bit—was the concept of adaptive management. We quickly came to the conclusion that we have been doing that for a long time and that we have lots of examples of adaptive management. We probably have not called it that until now, but it is a good phrase.

What has been proposed or consulted on with regard to a new approach to regulation is potentially an interesting way of taking forward an adaptive management approach. We would welcome that approach and we would like to sit down with the regulators and have more productive discussions about how we move it forward. We are in a consultation phase on that, which is open to suggestions and input from all sides. We are looking for the best way to improve the regulatory environment for fish farming and I think that we should all try to do that.

Mark Ruskell: The current consultation suggests that the new DZR approach should be applied to fish farms that are expanding in more exposed locations. Do you believe that that regulation should be applied to all fish farms, including existing fish farms in more inshore waters?

David Sandison: There is a combination of things there. We are looking at whether we can properly model that by looking at site-specific modelling that is more appropriate to the location of an existing site. If that gives a better model than the one that has been used in the past, or we can add to that model and better understand what is going on at site level, that is good and we should do that.

11:00

Mark Ruskell: Would you welcome the new regulation being applied to every fish farm in Scotland?

David Sandison: No. As some sites are currently located, if a strict interpretation of the

regulation as it is presented at the moment was to be applied that would be detrimental to those sites.

Mark Ruskell: Do you mean detrimental to the sites or to the businesses that operate on those sites?

David Sandison: Clearly, if it is detrimental to the site, it is detrimental to the business. I am not going to try and split hairs on that. The fact of the matter is that we should take that into consideration if we are going to change the regulatory system.

Mark Ruskell: Okay. Can I take other views on DZR?

Dr Collin: At LINK, our focus is on the environmental impacts and mitigating them. We have a new assessment in place—a new modelling technique that is more accurate and can give a more detailed view on the environmental impact—and we want to see that being used. If it is an improvement on previous models, we would like to see the new improved model being used on all fish farms to ensure that they are all meeting the standards that are in the new DZR.

John Aitchison: The new DZR has not been approved yet, but the proposal is that it will not use the existing idea of a conservative limit on how much biomass is used to limit the impact on the bottom or around the fish farm. The idea is that the farms can be 8,000 tonnes instead of 2,500 tonnes, but we will work our way up to 8,000 tonnes, monitoring the effect before allowing each increase until we detect an effect—which is supposed to be safe—and we will cap the capacity at that level. The problem with doing that is that the SAMS report and the PAMP 2 studies have shown that the impacts are not immediately recognisable. We might find out 10 years later that there has been an impact; for instance, emamectin lives for four and a half years on the sea bed and is still poisonous. There are cocktail effects; these things accumulate and they bioaccumulate in animals.

Take the case of Dounie, which is not offshore and is one of the places where DZR would have applied. Because it is dispersive it allows the waste to go away—86 per cent of the waste is allowed to leave and is not included in the computer modelling that drives DZR. That is not really minimal impact. The idea that pollution can be diluted until it does not make any difference any more is a discredited one from the 1970s. We do not know where it has gone.

As Mr Sandison said, DZR adaptive management is what has been happening already; it is what has been going on before rather than a new thing. It is like rebranding creationism as intelligent design. It is a marketing thing, which is saying that we are going to do something different and be more intelligent about it. In fact, the intelligent bit is responsibly, independently and transparently collecting proper data, analysing it for patterns and making sure that we apply the precautionary principle wherever we do not know the answer, which means now. We should work out what to do before we do it, and not do what Professor Tett said, which was to do it anyway, see what the effects are and then work out afterwards whether we mind the effects. Sometimes we cannot tell what the effects are for 10 years.

Mark Ruskell: Do you believe that there is anywhere in the world where that regulatory approach is successfully delivering environmental objectives? Iceland was mentioned last week.

John Aitchison: They have not started in Iceland. There is a proposal to do it from a blank slate in Iceland. If they were to do in Iceland what happens in the Faroes—where they have much less problem with sea lice—their DZR approach would be to say, “We will have zero tolerance of sea lice.” They kill all the fish if there are three sea lice per fish for three weeks. That is adaptive management; it is quite an intelligent thing. Adaptive management is just a term for the broad idea, “Let’s do it and see what happens.” It is not a solution; it is a really vague term that does not mean anything.

David Sandison: I cannot let that lie. The committee will have a transcript of what has been said and it is simply not true that in the Faroe Islands they kill all the fish if they have more than three lice. I am sorry—that is just not a fact.

John Aitchison: I can give you the information—I can circulate it later.

Mark Ruskell: My last question is whether there could be any unintended impacts of pushing fish farms out into more exposed locations in MPAs. We have already had some commentary on MPAs, but my question is about the extent to which they are appropriately assessed.

John Aitchison: The implication is that because fish farms will be far offshore, they will not do anything, nobody will see them and the location will solve many of the problems. However, all that is required—the criterion for a dispersive environment—is strong currents, which could be in, for example, the Pentland Firth, the Sound of Jura or the north channel between Northern Ireland and Islay. It does not have to be somewhere far away, but if it is, that just means that stuff will be spread further. A model that has just been published this year shows that sea lice from the mainland in Argyll can reach the Outer Hebrides. That is a dispersive thing.

Dr Collin: A lot of the research is showing that some of these chemicals can have an impact at very low concentrations. When you move farms into more exposed environments, you then increase the footprint of an area that can be exposed to low concentrations. We need to know more about which kind of chemicals are being used, in what quantities, and what their impact is at low concentrations.

Finlay Carson (Galloway and West Dumfries) (Con): I have a question on multi-trophic aquaculture. Obviously, the salmon farming industry wants to ensure that as many of its resources as possible can be put back into the system. A huge amount of nutrients being excreted by salmon end up sitting at the bottom of the sea. What sort of research are you looking at in relation to how those nutrients could be reused and put back into the food chain?

David Sandison: As the scientists from SAMS said at last week's committee meeting, there are some hypotheses about that and, in fact, it looks like a good idea. In various locations where salmon farming takes place, there have been projects to look at small-scale multi-trophic approaches, such as growing seaweeds and mussels and other species in the vicinity of the farm to get a balance of nutrients in that environment. At the local level—at a small level—it works very well indeed. There is certainly a case that we should be looking to do some more research to see whether we can expand that methodology.

I do not think that it will be what I would call a big ticket in terms of changing the whole balance, but we should be looking at doing more of anything that can help aquaculture to be positive in that respect. An example would be that in the Shetland isles, where I come from, we produce three quarters of the blue mussels in Scotland, and they live quite happily in salmon farming areas. The coexistence of mussel farming and salmon farming is very productive.

Dr Collin: The SAMS report talked about multi-trophic approaches and mentioned the spatial disparity. It said, I believe, that 1 hectare of salmon farming requires 10 hectares of seaweed growth. We are talking about requiring huge areas for an effective multi-trophic approach. I am not saying that it would have no effect or that it is not a useful approach to look into, but, at the moment, we are talking about huge areas of sea that would be required.

Kate Forbes (Skye, Lochaber and Badenoch) (SNP): I would like to move on to seals and acoustic deterrent devices. First, on lethal control measures related to seals, the SAMS report states:

> "Although the present licensing system has resulted in a decline in the number of seal shooting licenses issued, there are several areas where additional attention is still required".

It looks at, for example,

> "the reintroduction of closed seasons for shooting corresponding to the main nursing periods for seals".

What measures do you think are necessary to ensure that any welfare concerns to do with the shooting of seals are dealt with?

Dr Collin: Certainly, Scottish Environment LINK would discourage the use of the shooting of seals as a form of predator management control. We think that there are alternative methods that are available, such as tension nets, which can resolve many of these problems.

David Sandison: There is no real way to make it sound good if you have to shoot a seal, so we are not going to try to play the numbers game. However, we have driven the numbers down to a very low level indeed, and we have stated that we intend to continue to drive them down towards zero, by deploying whatever methodologies we can before we have to resort to using a licence to shoot a seal.

The number is very low indeed—it is in single figures per quarter. However, from time to time, a seal will be inside a cage of fish predating on the stock. In those circumstances, it is extremely difficult to do anything other than shoot it. All the measures that we are talking about, whether tension nets, predator nets or acoustic deterrent devices, are part of the canvas on which we work. In some cases, ADDs are appropriate. I refute the idea that they are left on continuously and have a massive effect on other mammals, because they are used only selectively and are not switched on willy-nilly—they are used only when there is a problem.

The Convener: I want to pull you up on that, because information from an FOI request from 2016 indicates that 60 per cent of salmon farms using ADDs are listed as always having them on. With respect, that is surely at odds with what you just said.

David Sandison: That does not concur with my knowledge of the situation. I would need to look at the FOI to see whether I could shed any light on it, but it does not concur with my knowledge of how industry practice operates at the moment.

The Convener: Do you recognise that it is not appropriate to leave ADDs on permanently?

David Sandison: We recognise that there is a potential impact on marine cetaceans in a certain zone around the farms and that, therefore, ADDs have to be used appropriately.

Kate Forbes: In 2011, Marine Scotland stated that, despite it being a licence condition, most shot seals are not made available for necropsy, thereby preventing an independent assessment of whether seals are shot according to the Scottish seal management code of practice and in such a manner as

"to ensure against a prolonged and painful death".

John Aitchison: Stopping shooting seals would solve all these problems. The industry needs to do so anyway if it wants to sell salmon to America—that condition is coming in quite soon, because the Americans are changing the rules. It seems like a no-brainer—just do not do it anymore. If so few are being shot that it makes no difference, just stop doing it. If the number is in single figures per quarter, how many is that per year? It is nothing.

The SAMS report says that ADDs have not been proven to work. Their use is unmonitored and the council says that it cannot regulate them. Their use is expanding, because the industry is expanding, and their effect is cumulative. They exclude porpoises from a 7.5km radius around one farm. Porpoises are a protected species. ADDs are used in the special area of conservation for porpoises in the Minches and the Firth of Lorn. To suggest that they are a mobile species and can swim away is just nonsense.

Dr Collin: Mr Sandison said that there is not a lot of evidence on the impact on cetaceans. There is a growing body of evidence on the impact on harbour porpoises. The devices induce stress, cause hearing damage and cause displacement—they change the behaviour of harbour porpoises by preventing them from going to certain areas. Although ADDs are not proven to be effective on seals, they have a significant impact on cetaceans.

The Convener: Are you suggesting that we should just not deploy them, or should we deploy them selectively?

Dr Collin: I refer back to a previous answer. We would prefer alternatives such as tension nets to be used. We would like the use of ADDs to be discouraged as much as possible.

Kate Forbes: Why are tension nets not used more?

David Sandison: I will clarify that. Farms use all those things. They use net tension systems and ADDs together. It is not one or the other; those things are all available for us to use, depending on what the most appropriate thing is for the environment that we are in and the type of predator interaction that we have. There will not be a single solution for all locations, because we do not need a single solution—we need to know what is most appropriate for each location. We have stated clearly that we will do everything that we can to stop having to use a licence to shoot a seal. It is simple to say, "just stop shooting seals"; we are stopping doing it. We know that there is a threat to certain markets if we do not comply with their requirements. We have to take cognisance of that and we will drive the numbers right down.

Kate Forbes: How do you propose to ensure better monitoring of ADDs? If there is a conflict about how often they are on continuously, how would you better monitor their use?

John Aitchison: That is the problem. They should not be used, because they cannot be monitored. That is the difficulty—how do you monitor them? They are not monitored at the moment because it is very difficult to do so. SNH has a role in deciding whether they should be used, but they are used in places such as the SAC that I mentioned. Even though SNH has a role, it is basically just ignored most of the time.

11:15

The Convener: There must be a means of identifying their use, because the FOI request appears to provide the evidence, which I presume came from the farms themselves. That conflicts with your position, Mr Sandison, which is that you do not recognise those figures. It might be useful if you came back to us on that, because there is clearly an issue here.

David Sandison: I certainly will come back to you. I am sorry that I am not aware of that information. However, we are the best people to tell you what is happening on farms. We have no reason not to. Our industry would freely provide that information to whichever agency needed it, which would enable decisions to be made about whether the use of ADDs was appropriate.

The Convener: We move on to questions about wrasse.

Finlay Carson: There are some concerns about the exploitation of wrasse populations, which it is felt could get worse as the scale of farming increases. Will the industry be able to achieve its target of cultivating all the wrasse that it uses by 2019? If it is not able to do so, will the wrasse wild fisheries require more regulation?

David Sandison: There are two parts to that. We have already started to make the necessary big investments in the hatchery facilities that are required to grow the number of wrasse that we believe could usefully be used in the marine environment. A new hatchery at Machrihanish has recently been approved, with a £14 million investment.

We believe that we will have enough wrasse in production by 2019 to meet our needs. If we do

not, we will be happy to engage with whomever we need to engage on voluntary measures that we can take with the existing wrasse fishery to ensure that we are not doing anything that might impact on the overall sustainability of that fishery.

Dr Collin: I want to pick up on the point about cultivation. To provide the number of wrasse or lumpsucker fish that are required to meet the demands of the industry, a whole new form of aquaculture is needed. That new wrasse and lumpsucker fishery will require resources, food and pest management. Over time, as we cultivate those species, some genetic traits will be chosen over others, as has happened with farmed salmon, to reduce sea lice numbers better. A concern that that raises is that, if there were to be a large-scale escape of farmed salmon, there would also be an escape of farmed cleaner fish, which would go into the wild population. We have had problems with escapes that have affected the wild salmon population.

There will be a need to fish for wild wrasse, even if it is to provide brood stock for the cultivation of cleaner fish. Wrasse numbers have dropped, and action has been taken in the south of England through inshore fisheries and conservation authorities to introduce management plans. We need more information on stock assessments, catch sizes and wrasse behaviour so that we can identify catch limits and manage the wrasse population as a fishery.

John Aitchison: The Machrihanish development will produce 1 million fish. It takes a year and a half to grow them. The cost of that is £40 million. According to the SAMS report, the predicted demand is 10 million fish, so we are talking about a £400 million investment to produce the number of farmed fish that are required. Is it really the case that £400 million will be put into farming wrasse?

The reason for doing all that is that the wrasse eat the sea lice. Closed containment would fix that problem completely—there would be no sea lice. If wrasse are put in a cage to eat the sea lice and they pick up disease from the salmon, something has to be done with the wrasse at the end of the production cycle. The plan is that, every 20 months, all the wrasse will be killed, whereas in Norway they are released—at least, I assume that they will all be killed. Is that the case?

David Sandison: Yes.

John Aitchison: Is that sustainable? A large proportion of those fish will be taken from the wild and moved up the country, where they might catch disease, and then they will all be killed. That is a by-product of the production of salmon. It is not sustainable.

The Convener: We have covered a wide range of topics. We will conclude the session by considering the issue of mitigation.

Alex Rowley: I was struck that it said in the SAMS report:

> "Recirculating Aquaculture Systems (RAS) might seem a logical solution to many of the environmental problems associated with salmon farming. By isolating fish from the natural environment, RAS provide security from diseases, infestations and predators and eliminate the risk of harming wild salmon. By retaining wastes, they prevent organic and nutrient impacts on the environment."

When I read that, I thought, "Therein lies the solution". I see that a Norwegian firm has announced a £500 million investment in a land-based aquaculture plant in America. There seems to be investment in such systems. Are they the solution? Is that the big ticket?

David Sandison: I view such systems as something for the future, in addition to what we are doing in the marine environment—they will supplement and enhance what we do in the marine environment.

If we took a complete change of tack and moved into land-based recirculating aquaculture systems, the carbon and physical footprint of doing so would be out of proportion to anything that we can think of. The report compares the carbon footprint of a marine farm operation with that of a land-based operation; the latter's carbon footprint is 1,400 per cent of the former's.

We farm extremely efficiently in the sea: we have an excellent efficiency ratio in our production of healthy protein. If we try to balance that against the impact that a land-based operation would have, given the consents, the space and the footprint, we can see that it is not even worth starting to think about.

However, if we are to expand in the future, we should develop and try to build on what we are already doing with recirculating aquaculture systems for small production. No doubt people will look at the equation in commercial terms and say that at some scale or other we can start to build land-based aquaculture facilities.

We will have to find ways of doing so in order to feed the planet, so such facilities are definitely not off the table. However, they are not the big-ticket items that will solve all the problems. We think that we can solve a lot of the problems in the industry. We have the ability to face up to the challenges, invest in innovation and try to find new solutions, and I do not think that we should abandon the way that we currently farm and supplant it with something else.

John Aitchison: There is a problem with the amount of energy that is involved in doing

containment on land, but that argument just conflates one problem with the next problem.

The first problem is that it is cheaper to farm salmon in the sea because the sea is used as free waste disposal for all the pollution. If the industry paid for its pollution, as every other industry has to, it would cost what it costs in Norway, and Norway is moving to containment and complete separation of farmed fish from the sea. Even Marine Harvest in Norway says that it is necessary to do that.

Norway is moving to containment because it is an environmentally conscious country. It does carbon audits on everything, and it thinks that the risk of farming in open nets is greater than the risk of closed containment. Even Trump's America is doing that in Maine, for goodness' sake.

We cannot carry on doing as we are doing. We should work out how to fix the problems that exist now and we should not expand until we have done so. That is the precautionary principle. We are obliged to do that.

Dr Collin: Certainly, closed-containment technology has huge potential for alleviating a lot of the problems that we have been talking about. Obviously it comes with other environmental concerns, so a clear cost benefit analysis is needed to compare the two different approaches adequately.

There is a huge amount of investment in the technology in other countries including Norway, but nothing seems to be happening here. There are no pilot projects—there is nothing. We recognise that the technology is at an early stage and we cannot expect it all to happen tomorrow, but there are a lot of other technologies out there that involve some kind of semi-closed containment—for example, keeping fish at certain depths to reduce the sea lice problem—which are not being investigated or put to use in Scotland. There are many interim methods and strategies that could be put in place while we wait for closed-containment technology to become economically viable.

The Convener: To back that up to an extent, the technology for closed containment is transferable, so surely Scotland should invest in all such measures and others will develop the technologies that we can import.

John Aitchison: Scotland should lead the way, but it is behind: we are on the back foot and Norway is leading. Do we want to be as cheap as Chile and compete on the basis that we are cheaper and produce a lot, or should we raise the standards and compete based on being the best? Scotland is good at engineering.

Donald Cameron: I think that all the witnesses are saying that, to be realistic, the SAMS report is right when it concludes that

"It seems likely that the majority of salmon production in the sea will, for the foreseeable future, continue to take place in net-pens."

I have a question for Mr Sandison. Would it be much more expensive for the industry to commit to recirculation systems than to continue with what it currently does?

David Sandison: I like the idea of a cost benefit analysis. I am sure that we need to do one.

We are really up for innovation: we are up for trying different growing systems in the sea. We do not have a problem with closed-containment systems being applied in the sea or with considering how we can implement effluent treatment within those systems. We already have substantial investment in well boats for carrying out an awful lot of the rudimentary work that we need to do on farm sites to move and treat fish. We can now build effluent treatment or capture and filtration systems into those well boats.

We are investing heavily in those measures and are moving forward with investment all the time. A cost benefit analysis is always required when we take a decision on how to move forward, so I do not suggest for one minute that we will stand still and not do that.

Donald Cameron: I hope that it is not a controversial point to make, but it is surely cheaper for you to farm at sea in open nets than in closed containment. Is that right?

David Sandison: Yes.

John Scott: I come from an engineering background and would like to see an engineering solution to many of the problems that we have talked about. At the moment, nothing is happening on sea-bed deposition, and the alternative is closed containment. In between, there must lie an engineering solution. Fish cages are suspended in the water, so something like a tray of a similar dimension could be suspended beneath them and cleaned out regularly. In agriculture, we had old things like dung spreaders with a conveyor belt that moved all the stuff to one end. The material could be sucked into a pipe and on to a ship and taken away. The trays could be cleaned out once a week.

Why would you not do something similar to that? It is an engineering solution. It is not an impractical thought and I cannot understand why the idea has not already been developed. It would clear off the mess that causes so many problems, including emamectin lasting for a long time on the sea bed. Why not take it away and dispose of it properly? I believe that research is being done on

that approach in Norway. Perhaps you will tell me more about it.

Dr Collin: We have recently heard that, in Tasmania, a kind of funnel is used underneath the salmon farms. Apparently, that catches 60 to 70 per cent of the waste. It is then funnelled out and part of it is converted into fertiliser while the rest is treated.

John Scott: That is a big start.

John Aitchison: How much money do the industry and the Government put into researching closed containment in Scotland? There is a trial at Machrihanish being run by a Norwegian company doing exactly what we are talking about on land, which, I think, has concluded successfully, but there is almost no information about it. Are we investing in it? I heard that, in its submission on the salmon and trout conservation petition to the committee, Marine Scotland said that it was watching with interest. Is it paying for it? Are we putting money into it?

David Sandison: To return to the question about an engineering solution, I reiterate the point that the industry is 100 per cent committed to innovation in all areas of its operations. A number of engineering solutions are already being pursued. None of them has been brought through to full commercial implementation as a mainstream solution to problems because they are not proven yet.

11:30

There are some systems out there that can be bought off the shelf—lift-up systems and ways in which some of the effluents from farming operations can be captured. Some of them are already in use in Scotland. In our operations, there are significant attempts to minimise the amount of treatments. We will look for technology and for engineering solutions. We do not have the solution yet, but there is nothing to stop us working towards it.

The Convener: Before the final question, I point out, before the convener of that committee seeks to point it out, that the salmon and trout conservation petition was dealt with by the Rural Economy and Connectivity Committee.

Mark Ruskell: It appears that the main concern about closed containment systems is the energy that they require. However, with open pens we have the problem of nutrient waste. Is there a way to take the nutrient waste that would be captured in a closed containment system and put it through anaerobic digestion in order to generate the energy? Do you know of any research that is under way along those lines?

John Aitchison: The Machrihanish example would be the one to look at. The Norwegians say that a study was done by a Norwegian university that proved that such farming is economically equal to farming in open nets in the sea. It would be worth your while to have a look at that.

David Sandison: I will say only that a number of attempts at land-based closed containment have been made over the years. Some have come to a conclusion and some are still happening. The committee would be well advised to find out as much as possible about those systems and the exact outcomes of the work to date.

The only other issue that I have not touched on in relation to what we do in the sea being transferred to a land-based system is whether it would improve the overall wellbeing, health and welfare of our fish. It is more than likely that the stocking densities in some of the experiments that have been done around the world were significantly higher than the stocking densities with which we farm fish in the sea.

The Convener: The fish would be free of sea lice, I presume.

John Aitchison: And 25 per cent would not die each year.

The Convener: Let us wrap up at that point. I thank all the witnesses for their time this morning. It has been very useful to explore the various issues.

I suspend the meeting briefly while we change the panel.

11:32

Meeting suspended.

11:39

On resuming—

The Convener: I welcome to the meeting our second panel giving evidence on the environmental impacts of salmon farming in Scotland: Anne Anderson, the Scottish Environment Protection Agency; Mark Harvey, Highland Council; and James McKie and Rob Raynard, Marine Scotland. As you will understand, the committee will ask you all a series of questions.

I want to look first at how things have progressed—or otherwise—since 2002, perhaps in two regards. First—you might have heard us asking the first panel this question—can you illustrate for the committee's benefit examples of the precautionary principle being deployed in the expansion of the sector?

Secondly, on the issue of regulation, it strikes me that we have fish farms leasing the sea bed from the Crown Estate, obtaining planning consent from the local authority and then being policed by SEPA and the fish health inspectorate. It appears at face value that oversight of their activities is insufficiently coherent. Are we regulating sufficiently—and, indeed, sufficiently effectively?

Mark Harvey (Highland Council): On the first question, the precautionary principle is, of course, embedded in European environmental legislation and is therefore applied. We cannot just ignore it. Speaking as a planner, however, I have to say that I do not like it as an approach, because we are paid to take decisions—which, in my case, are to do with recommending approval or refusal of planning consent. We need to do that on the basis of definite, clear and evidenced reasons, not just because we are not sure and do not feel like making the decision.

That said—and winding myself back a little—I would point out that we have recently started to use environmental management plans, which have already been mentioned. They are embedded as conditions in planning permissions, and they provide a method of engaging with the industry over time. In effect, therefore, they amount to a monitoring condition, and they allow us to get involved over the lifetime of the consent, which might be considerable, in the monitoring of, for example, sea lice control and escapes. I would very much call that a precautionary approach. It is not the kind of hard enforcement role that planning authorities often play, where there are clear parameters and any breach leads to clearly defined enforcement measures. It is a softer approach, and I suggest that that is where the precautionary principle can be seen most clearly.

The Convener: Is the regulation of the sector sufficient, given what we have seen in the report that we have been discussing?

Mark Harvey: Is it sufficient? Having come to this job and responsibility a couple of years ago from a development management and enforcement background, I think that this sector is as difficult as anything else that a planning authority has to deal with. From a planning authority point of view, the regulations are quite frustrating, and we do not feel able to come up with very clear answers or recommendations for our committees and so forth. As a consequence, the environmental management plan takes a slightly soft-edged approach to monitoring instead of the more hard-edged approach that we probably apply in other areas of our work.

Anne Anderson (Scottish Environment Protection Agency): In SEPA's licensing role, we set environmental quality standards. As far as the precautionary approach is concerned, there are controls in place. Mark Harvey has referred to the kinds of controls that are used in the planning regime; the environmental quality standards that we have set in the CAR consent regime offer protection outwith the zone of impact, and they relate both to organic and to chemical loads.

The standards are also used as a baseline. A baseline assessment is required as part of the application process; we use modelling tools to predict environmental impact, and we use those predictions to set limits on the size and scale of a facility. Monitoring is then done on compliance not only with those limits but with environmental aspects, through the outputs of what is known as benthic analysis and chemical residue sampling. That is largely done by the operators, and SEPA undertakes a compliance and auditing monitoring programme, undertaking sampling and analysis in respect of compliance and audit checks.

11:45

With regard to the precautionary approach to the environment, every environmental quality standard is set through the use of EU directives—specifically, in this industry, the EU water framework directive. We are currently going through a process of assessing and improving the EQS in respect of emamectin benzoate, which has previously been mentioned. Standards are set where they are needed to protect the environment. Where there is any uncertainty, they are specifically set to a higher level, which allows tighter control—I think that David Sandison mentioned that earlier in relation to Scotland's environmental controls in the fish farming industry.

The Convener: You said that, largely, the sector provides a lot of the data for the monitoring that is done. Could you quantify that? To what extent does SEPA do its own independent monitoring and analysis rather than simply taking what it is told by the sector?

Anne Anderson: As an environmental regulator, we regulate the sector in the same way as we regulate every environmental activity, whether land-based or water-based. The predominant theme is that there is operator monitoring and reporting of that, and there is a resource that is allocated against the findings. I do not have the percentage with me, but I will provide you with that.

The Convener: In effect, would the industry not have to incriminate itself in order to be regulated?

Anne Anderson: In essence, there is a requirement to notify us of analysis being undertaken. That allows us a window of time to do an audit of that analysis. There is also the ability for us to undertake additional audits. Last year, we did a programme in Shetland over an eight-week

period specifically assessing our capability in terms of the future regime—reference was made earlier to DZR. That will enhance the volume of monitoring and the type of analysis that is being undertaken in the industry. In order to provide additional sound science and scientific evidence, the monitoring protocols are likely to be changing through the course of this year and next.

The Convener: So there is no programme of unannounced visits across the sector.

Anne Anderson: There is. As a regulator, we undertake our business predominantly through unannounced visits, which can involve inspection at the facility. Not all of our regulation activity is down to scientific sampling and analysis; there are other means of tracking the use of medicines and feed quantities. We use a range of tools to monitor and regulate the activity.

The Convener: How many unannounced visits are made to fish farms across Scotland annually?

Anne Anderson: Again, I do not have those figures with me, but I will provide you with them. We undertake a risk-based assessment when it comes to inspections and announcements. There are approximately 400 licensed marine cage fish farms, with about 290 to 300 in operation at any one time. There is a programme of inspections that also includes that sampling and analytical capacity as well as the regulatory role. I will provide you with the full details.

The Convener: Thank you.

James McKie (Marine Scotland): The position of Marine Scotland is slightly easier, in the sense that we operate in a complementary way to the main regulators, which are SEPA and the Marine Stewardship Council. When we are reacting to a situation in which an investigation might have to be undertaken, that is dependent on the timely submission of information at key points in time. That is what enables us to determine whether we need to undertake any investigative action or further consideration.

The Convener: Rob Raynard, is it not a bit bizarre that the fish health inspectorate would look inside a cage but not outside it? I realise that you work to the rules that you work to but I am looking at it from a layman's perspective. Should looking at the impacts immediately outside the cages not be part of the regime that you follow?

Rob Raynard (Marine Scotland): Since 2002, the big change in health has been the Aquatic Animal Health (Scotland) Regulations 2009. There is a focus on biosecurity on the farm. That legislation covers a number of listed and notifiable diseases and, when we find those diseases, we do look outside the farm to see whether wild fish have been affected or, indeed, how the presence of the disease in wild fish might impede or have a bearing on how we treat the farm to eliminate the disease.

That is for the listed diseases that are part of the EU framework that is implemented in Scotland. It requires authorisation of farms and sets out the measures that farms have to have in place, specifically around biosecurity, record-keeping, disinfection, and the way in which they are stocked. They also have to specifically address how the veterinary assistance that is called on in times of disease will be made available to individual sites. There is therefore a remit that covers outside the farm, but it is not a big part of the work.

The other big change since 2002 is, of course, the Aquaculture & Fisheries (Scotland) Act 2007 and 2013. That legislation is very much focused inside the farm, although it makes some reference to the ability to trace escapes outside farms.

Coming back to the Aquatic Animal Health (Scotland) Regulations 2009, I would say that one of the biggest threats to Scottish wild salmon is exotic disease, particularly a parasite called Gyrodactylus salaris. At the moment, that is eliminated through the measures that we have in place to prevent its import through trade. Those measures protect all stocks, farmed and wild, in Scotland from that parasite. That is an example of where the powers that we have cross boundaries for listed diseases.

The Convener: Is there not a risk that you all do your own thing and we end up with a system that does not regulate an industry in the most appropriate way?

Rob Raynard: In my area of fish health, the programme for government's development of the farmed fish strategic health framework involves a number of regulators delivering an optimisation of and improvement in overall fish health in Scotland. That involved SEPA as well as Marine Scotland.

There are other examples in relation to the EMPs that we have discussed, and they rely on science, because industry will have to demonstrate that it is not having an impact and science is important for that. Although it is not a fish health inspectorate aspect, we draw on relevant work in relation to Marine Scotland science. In the fish health inspectorate, we rely only on scientific knowledge to make risk-based and evidence-based decisions.

More widely, we have a long-term programme of research looking at the distribution of wild salmon and the migratory routes. We can use that knowledge, together with information on the location of lice in the environment, to inform the planning process. It is not a finished area—I think that the SAMS report referred to at least a 10-year

programme to get there—but we have started on it.

There are several published peer-reviewed reports that are not included in the SAMS report, probably because they focus more on the co-existence of the sectors and being able to advise on planning. However, we have developed tools for the monitoring of lice in the environment and the migratory routes of salmon and sea trout. We have evidence, which is available, in relation to settlement and impacts on individual trout, but we do not yet understand how to take that to a population impact. There is also research, which started about three years ago through Scottish Aquaculture Research Forum funding, that aims to identify impacts on wild salmon.

Anne Anderson: We would be unable to operate our controls without having close dialogue with Marine Scotland on the link between fish health and the use of medicines. As an environmental protection agency, we always seek to try to reduce the impact on the environment, be it from organic or chemical loading. We work with Marine Scotland in respect of fish health and changes to it. That is an integral part of our work, particularly with some of the techniques that have been referred to. There is therefore the potential to ensure that what we put into any CAR licence does not thereafter lend itself to perverse practice. That is as relevant for us as it is for any other regulator sitting at this table, given the interdependencies between the regulatory strands of work.

The Convener: Before I open the discussion out to colleagues, I have a wrap-up question. As regulatory practitioners, do you feel that there are any gaps in regulation that require to be filled for the benefit of the environment?

Mark Harvey: From our point of view, the most obvious one is the protection of wild fish, particularly from sea lice. As a planning authority, we are generally content to rely on the regulators and their work on disease control, the health of fish in the pens, benthic modelling and the deposition of material around cages. That is as comprehensive a regulatory procedure as any that we deal with in other areas.

However, it seems to us that the external impact on wild fish through sea lice is an issue that we have had to move forward on as a planning authority, simply to satisfy ourselves that something is being done, which takes us back to the precautionary principle. We want to avoid having to say that we cannot take a decision because we just do not have the information. From our point of view, we share that problem with Marine Scotland, which is a consultee for us. However, it is not in a position to offer support or make objections with regard to sea lice impacts on wild fish, because the scientific data is not there that would allow it to defend its position, were it to be challenged.

The Convener: That is interesting. Thank you. I open out the discussion on fish health and mortality, starting with Kate Forbes.

Kate Forbes: The witnesses will have heard the earlier panel's comments about the level and cause of fish mortality. What is your response to those comments on the extent of fish mortality? I will widen the question: what is your view on the level and cause of fish mortality?

12:00

Rob Raynard: I am not making an excuse, but with any livestock production there will be health challenges. The aquaculture industry is no different in that regard.

We do not have rigorous scientific evidence on every event and every cause of mortality, but I will summarise what we know. The last time that we looked at the issue in detail, through a cross-section involving one big company, we found that about one third of mortalities are caused by infectious disease and two thirds by other means. As David Sandison, who was on the first panel, said, there are particular challenges around harmful algae and microscopic phytoplankton that damage and irritate the gills. There are also quite unpredictable jellyfish blooms that can cause fish health issues, and there are other events such as storms. In recent times, mortality has increased, and what David Sandison said about the complex reasons—between gill health challenges and the bath treatments that are associated with them—rings with our experience. Mortalities might be attributable not to a classical infectious agent but to a complex mix of environmental factors, including the presence of a paramoeba that is associated with gill health problems. That is a natural amoeba. We do not know precisely where it comes from, but it has been found to grow on the surfaces of farm equipment, so it could be that there is a place in the environment in which it occurs naturally and that it has found an opportunistic place in farmed salmon. That is a key thing.

As far as infectious agents are concerned, we see viral diseases, including, in particular, some that result in heart problems in fish. The synergy between different problems has been mentioned. If fish are affected by heart issues and the gills are also affected, that gives them a respiratory challenge.

Another thing that has changed since 2002 is the availability of specialised fish veterinary advice, which has expanded massively, and we have laboratories that support the vets. The

industry has access to vets, who have an ethical obligation in relation to the care and welfare of the animals, so that aspect is certainly covered by the legislation.

Kate Forbes: Does anybody else have any comments?

Mark Harvey: Hard though it may be to say, the mortality rate will not be a material consideration for the planning authority in making its decision. We make our decisions with reference to national and local policy. There is certainly enough positive policy in existence to suggest that the Government wants to support the industry as a whole, including the whole set-up of aquaculture, and that local authorities should support it, too. Consequently, it is not a factor that we would take into account.

Alex Rowley: On Mark Harvey's point about material considerations, in the 1990s and 2000s, the level of mortality was around 20 per cent of fish stock but in recent times it has risen to possibly 25 per cent. Is that a material consideration? There are lorry-loads of millions of fish that have been killed—the salmon runs or fish runs, as they are called. How is all that fish disposed of? Is that a material consideration in the planning process?

Mark Harvey: It could be. It has not been raised with us, but if it was suggested to us that we needed to think carefully about how dead fish would be moved from a site—I presume by road—I would certainly look for comment from my roads colleagues and perhaps Transport Scotland on the appropriate way of doing that.

I might also look for comment from other regulators, if the transport of dead fish raised regulatory issues. That has not happened yet, but I think that the issue is material, because there is a physical impact on the road system and it might raise other issues.

Rob Raynard: Marine Scotland science and the fish health inspectorate are statutory consultees in the planning process. In the context of our responsibilities in relation to fish health, we take account of whether a farm has in place provision for dealing with large-scale mortalities. Indeed, as part of the authorisation process that we undertake, farms must, under the biosecurity measures plan, have in place protocols and procedures for how they handle mortalities and remove them from cages. Farms remove mortalities very regularly, which minimises the opportunity for pathogens to get into the environment.

On the impacts of disease on wild fish, which is referred to in the SAMS report, we take a slightly different interpretation of the 2017 Wallace paper from that taken by SAMS. The research was conducted by Marine Scotland science. We interpret the paper as including a lot of very structured surveys, which provided evidence that the impact of infectious disease on wild fish is likely to be minimal. On that basis, we have focused our resources on trying to understand the sea lice interactions; we think that that is a more beneficial use of the resources that are available to us.

Claudia Beamish: Alex Rowley talked about the transportation and disposal of dead fish. The issue is particularly important in view of the number of mortalities that we have been talking about. Do the regulators or local authorities have a view on whether the regulations, protocols and options for enforcement and prosecution are appropriate?

I refer you to an FOI request about an accident on the A9, which I mentioned in a question to the previous panel. The response to the FOI request showed that the police reported only to BEAR Scotland. There was photographic evidence, which I have been shown, that the lorry simply had a tarpaulin over it—I stress that that was photographic evidence.

In view of the amount of mortalities, is there evidence that the current approach is right? If not, how should we change it?

Anne Anderson: SEPA does not regulate animal by-products, but we regulate the transportation of waste. Now that there is no longer a derogation for disposal of mortalities at landfill sites, we are concerned about the issue, given comments about the volume of dead fish.

The facilities that receive those dead fish are licensed by us under different pieces of legislation, and, as with any other waste stream—particularly waste of an organic nature—we are quite concerned to ensure that, when they arrive in a locality, they do not give rise to problems there.

We will be exploring the issue in more detail with the industry, because we license on the basis of environmental impact, concerns about the numbers with regard to the product for which the licence is being given, environmental sustainability, the transportation issues and the on-going issues that might present themselves at further-flung locations. Given the nature of organic waste transportation, it can give rise to problems at the point of receipt, and as part of the wider focus of our current regulatory approach, we look at an entire sector—in this case, the fin-fish sector—and at all avenues of regulation to ensure that there is full compliance. Those are the discussions that we are having at present and which we will continue to have as we move into the sector-based regulatory approach that we are taking underneath our regulatory strategy.

Claudia Beamish: Before anyone else comes in, can you tell us, for the record, how the dead fish are disposed of?

Anne Anderson: There are energy-from-waste facilities such as anaerobic digestion plants that receive that material. However, such facilities are further flung, and we need to identify proximity solutions for a range of organic waste. It is an essential part of the discussions that we are having.

Claudia Beamish: Does anyone else wish to comment?

Rob Raynard: With regard to the environmental aspects of the waste, I do not know whether you have seen a report produced by Zero Waste Scotland in 2017, which essentially says that the waste is quite valuable, because the lipids and proteins in it are of high quality, and it identifies routes, including pharmaceutical, for using such products.

Claudia Beamish: Thank you—I did not know about that report. Does the transportation issue fall within your remit?

Rob Raynard: No.

Claudia Beamish: Are you concerned about it?

Rob Raynard: For sure—we are concerned that the transports need to be contained, simply from a spillage and biosecurity point of view.

Claudia Beamish: How should they be contained?

Rob Raynard: They should be contained to prevent—

Claudia Beamish: Is, for example, a truck covered with a tarpaulin acceptable?

Rob Raynard: Generally speaking, we as regulators do not specify that. It is not my area of regulation.

Claudia Beamish: Whose area would it be? I am not trying to quiz you on this—I just want to find out who would regulate in that area, given the concern that has been expressed about environmental aspects such as spillages and so on.

Mark Harvey: I do not know, but I suspect that responsibility for it might well fall to either the local authority as the roads authority or the authority responsible for trunk roads.

Anne Anderson: The animal by-product regulations are enforced by the Animal and Plant Health Agency. With regard to transportation, as with any waste, one would expect certain levels of containment from an environmental perspective, given the concerns about the potential for discharges into watercourses and so on in the scenario that Claudia Beamish referred to. However, as I have said, the Animal and Plant Health Agency is responsible for regulating animal by-product issues.

In any other context, the duty of care applies, and the matter would come under the waste controls that are set out in the Environmental Protection Act 1990 and those for which SEPA is responsible. However, because animal by-products are involved, the lead authority in question is not SEPA, but another agency.

Mark Ruskell: The transportation of ever growing numbers of dead salmon is a symptom of a wider problem. Coming back to the issue of salmon mortality, I want to ask Rob Raynard what he thinks is an acceptable level of mortality in a salmon production system. In the earlier session, we heard figures ranging from 4 to 40 per cent. From a fish health perspective, what level is acceptable in a production system?

Rob Raynard: I do not think that we can identify a desirable or acceptable level.

12:15

Mark Ruskell: Is 40 per cent acceptable?

Rob Raynard: It depends what the cause is, whether it is a recent change and what the industry is doing about it. The context is critical. I know, as I said before, that the recent increase is largely driven by environmental factors. The industry elsewhere, including the industry in Norway, is joining forces with the industry in Scotland to understand what those factors are and what the solution is.

The mortality level is not something that we like—nobody likes it—and people are approaching it in a concerted way; there is an international approach to solving it. An international group called the gill health initiative meets annually. It includes the industry, researchers and regulators. They look at how the science has moved on, what is causing the problem and what the solutions are. We heard about some of those solutions from David Sandison this morning. Best practice to tackle the problem is developed in that type of forum. If the industry has a high mortality rate and nothing is done about it, that is not acceptable. If the industry is tackling it and it is driven down, that is a good thing. It was mentioned before that other livestock industries have mortality issues.

Mark Ruskell: You mentioned context. The context of this inquiry is that the Government and the industry want to double production by 2030. Do you believe that the level of salmon mortality will go up or down if we double production? What do you see as an acceptable level of salmon

mortality? Is it acceptable that a quarter of the fish die before they go to market?

Rob Raynard: Just to clarify a point, the aquaculture industry leadership group identified the target. The Scottish Government supports the target, if it is reached sustainably—and that is the question. Would we support a doubling of production with such a high mortality? That is more difficult. What came out from the discussion this morning was that the industry will need to address the mortality issues in order to be able to expand.

Mark Ruskell: Is that target being reached sustainably at the moment, given the mortality levels that we have?

Rob Raynard: It depends. If the mortality is having an environmental impact, it is an environmental issue, but at the moment a lot of the mortality does not have a big environmental aspect and is more about economic sustainability. That is more a matter for companies to address.

The Convener: To quantify the problem, and to assist the line of questioning that Mr Ruskell is developing, let us come at it from another direction. How does the fish mortality rate in Scottish aquaculture compare to that elsewhere—in Norway, for example?

Rob Raynard: Norway is currently experiencing mortality events in the region of 20 per cent. The long-term average in Scotland was around 20 per cent. It has gone up recently, largely through the gill health environmental issues and the associated treatments to tackle that. However, the industry and regulators in Norway are also keen to tackle the issue of mortality, as we are in Scotland. We are not saying that it is acceptable.

The Convener: We were told last week that considerably more investment in science to look at these issues is taking place in Norway than is taking place here. Is that the case?

Rob Raynard: By and large, that is the case. The techniques and technologies that are developed in Norway are often transferred to Scotland, Ireland, Canada and Chile. I mentioned the example of the gill health initiative, which brings together industry, scientists and regulators from the international sector to share best practice. Everybody wants to drive down the rate of mortality, and what the Government is doing through its development of the strategic farmed fish health framework is the right thing to do, as it brings everyone together to tackle the issue cohesively.

Richard Lyle: In my mind's eye, I have a picture of dead fish swilling about in a lorry that is depositing liquid on the road, but that is surely not what happens. Surely there are containers or skips in big self-contained lorries that do not leak on the road. Is that the case, or am I wrong?

Rob Raynard: You are right. Sometimes tankers are used and they are very well sealed. I guess that it comes down to the availability of vehicles at the time. However, that is no excuse for not complying with what is required under the regulations.

Richard Lyle: Why can the dead fish not be handled on the site? Is it because SEPA says that the fish have to go to a certain place, because the farm does not have the right facilities—because it has not invested in facilities that could do something with the fish?

Rob Raynard: Small biodigesters are available and can be put on to sites; in most cases, they can deal with the small mortalities that are almost inevitable. However, the large-scale mortalities are of such a volume that they have to be dealt with off-site. The cost of maintaining a digester that can handle 150,000 fish would be huge, but it might be needed on a site only once every five or six years—if that. It is about costs, benefits and proportionality.

Alex Rowley: I have two brief points. On TV, we have seen the BBC following lorries along narrow roads and stuff coming out of the back of the lorries on to the road. The transportation of dead fish is not what it should be.

Mr Raynard seemed to say that all those dead fish have no impact on the environment and that there is simply an economic impact. Is that not stretching it a bit? Surely there is an environmental impact from that level of mortality, as well as from what the companies are doing to tackle issues such as sea lice. Is it not a big leap of faith to say that there is no environmental impact from fish farming and from the fact that 25 per cent of farmed fish are killed through disease?

Rob Raynard: Some clarification is needed. I guess that there are some environmental impacts, but I was trying to say that, because the mortalities from disease are regularly removed, the environmental risk from the disease is minimised. Then it becomes, as you say, the environmental aspects of the logistics, or the loss of biological production by the business, which has had environmental input to generate. There is that aspect to it. So yes, there is an environmental aspect.

Mark Harvey: I will talk about a perspective that has not been mentioned so far. Most fish farm planning applications that come in are considered to be environmental impact assessment applications and cover that ground, and most come in with an environmental statement. I think that I am right in saying that most environmental statements will include a short section on the

disposal of mortalities. It is certainly now in my mind that that is an area that planning authorities—or, indeed, the applicants—might need to put a bit more emphasis on. Such questions should not exist. If such activity is a feature of a farm's production, then the impact on the road, at least, is an environmental impact that needs to be addressed.

The Convener: In that context—to pick up on Anne Anderson's point—perhaps a location for the disposal of those fish should be identified.

Mark Harvey: It is probably necessary to go that far.

The Convener: Thank you for that.

We turn to the discharge of medicines into the marine environment.

John Scott: I have a quick question for Anne Anderson of SEPA. Will you tell the committee about your recent work on environmental quality standards for emamectin benzoate? Where do we go from here?

Anne Anderson: An environmental quality standard for the use of emamectin benzoate was set a number of years ago. We recently commissioned a desk-based study of all the available intel on emamectin benzoate, which recommended a tighter environmental quality standard. That piece of work will go to the UK technical advisory group—UKTAG—that was set up under the water framework directive, which uses the principles of the EU directives to ensure that there is consistency in the setting of environmental quality standards. That report will go to the UKTAG for a peer review exercise, as is common with any scientific document. Out of that process, we expect to get a response on the body of work that has been commissioned to date. It is intended that it will then be provided to the Scottish Government, as is consistent with environmental quality standards under the water framework directive, and that the Scottish Government will issue a direction for the use of that standard.

In the interim period, we have information that lends itself to a tighter control of the use of emamectin benzoate, and we have put in place a position statement that accommodates the current situation up to the time when that piece of work is concluded. The focus of the protection work is at the precautionary end when it comes to all new applications that involve a marine protected area or a priority marine feature. When the process identifies features that might be impacted by the use of emamectin benzoate, that tighter standard is being adopted with regard to the measurement and usage of the substance.

At present, the process is under way. The study will go to the UKTAG over the course of the next month. We are waiting for the output from that piece of work.

We utilise the best available information. We then identify where we need to employ that stricter standard. In this case, we have done so in areas in which emamectin benzoate has not been used before—in particular, in areas that have a crustacean population or a sediment population of concern.

John Scott: Thank you.

Should sediment quality be incorporated into Marine Scotland locational guidelines, as suggested by Professor Tett?

Anne Anderson: As far as the assessment process is concerned, there is a locational guideline document that we use. We also use the additional information to hand. A range of packages of information is available, but having all the information in a single framework would be a positive step.

The overall assessment of cumulative impacts and spatial locations is an area that I am very keen to explore with other regulators. We have been discussing that aspect, because there are gaps in the information, as your witnesses at last week's meeting identified, and the ability to fill those gaps is key.

12:30

The Convener: Before I ask Mark Ruskell to move the discussion on to nutrients, I want to pick up on the more general issue of marine protected areas and protected features. The report indicates that in 2003, 16 salmon farms were sited above maerl beds. We have learned that, currently, 25 farms are located within MPAs that are designated for maerl beds, and we have been told that two years of fallowing does not enable beds to recover. Why on earth are we allowing salmon farms anywhere near these features?

Anne Anderson: We undertake a baseline assessment of the information that is available at the time and we utilise information that is available from other bodies. Every application is assessed on a range of environmental factors. In respect of maerl beds, there is recording in and around the reference stations; reference stations are outwith the zone of impact—they are the baseline set-aside. The available data provides information that forms part of the key aspects of the controlled activities regulations application process. The baseline and seabed assessments are needed and provide information on whether a marine protected feature is present, such as maerl beds.

The Convener: Sorry, can you respond in layman's terms? Do we have fish farms that are located sufficiently close to maerl beds in MPAs that they could be having an impact? Is that happening or not?

Anne Anderson: The information that I have is that there are 29 sites that are currently positioned in and around areas where maerl beds are present. Maerl has not been recorded as present recently at 13 of the 29 facilities, so the answer is yes, there are existing and on-going facilities in and around areas where maerl has been identified as present.

The Convener: And they are having a detrimental effect on maerl beds.

Anne Anderson: The facts that I have are simply that the presence of maerl has been recorded and it is now recorded as present at 13 facilities. That is recent information.

The Convener: Right.

Mark Ruskell: Should the use of emamectin be phased out, and if so, over what timescale?

Anne Anderson: SEPA has undertaken a reduction in the use of emamectin. A blanket variation has been applied to all active operating fish farms—those that are currently operating and those that might operate in the next cycle—to restrict the total quantity of the medicine that can be used. In relation to the tighter environmental quality standard, the position and the assessment point have not changed. By default, that in itself will require a reduction in the use of emamectin benzoate.

Mark Ruskell: Could the approach lead to a ban on its use?

Anne Anderson: I am aware that additional research is being undertaken on the ecotoxicity of emamectin benzoate. I referred to a desk study that was based on laboratory information. A research project is under way that is trying to mimic the marine environment, and the output from that work will add to the science in the area. As a regulator, we keep informed and react to the changing scientific information.

Mark Ruskell: On nutrients, you heard what the previous panel said about the new depositional zone regulation that SEPA is putting forward. You will have heard concern about the lack of scientific evidence to underpin the approach. Where do you see the DZR going? Should it cover all fish farms? Why is the approach limited to expansions in more exposed locations? I do not understand why it does not cover the entire industry.

Anne Anderson: The DZR consultation has closed and we are reviewing the responses. We received 144 pieces of information from a range of stakeholders, including industry and community stakeholders as well as other regulatory bodies. Part of the approach is in respect of the transition and the introduction of a new regulatory approach to fish farming. I envisage that being a transition across the entire fish farm licence process. DZR introduces additional monitoring and adds to the information base. It also allows for what has been referred to as adaptive management, although there is an element of that under the current CAR environmental licence controls. SEPA, as a regulator, takes the evidence and then pulls back and undertakes action if it is not predicting the expected environmental impact. DZR will provide a greater level of monitoring and evidence. We will then be able to assess against that, and each business will be able to adapt within its zone of impact.

The Convener: Claudia Beamish has a supplementary before we move on to sea lice.

Claudia Beamish: My question is for Anne Anderson. In relation to MPAs, you have highlighted maerl beds. Is there any opportunity for regulation, if it is thought necessary, to stop the activities of a fish farm that are affecting maerl beds or any other protected feature? What would that process be, if it exists?

Anne Anderson: That is part of the CAR consenting regime. I will provide details of the process to the committee, but I will do my best to summarise it. SEPA is a competent authority under the Natura legislation. We undertake habitat impact assessments and consult with Scottish Natural Heritage to ensure the accuracy of the information. Part of that is to ensure that any permit is in compliance with the wider range of environmental information. The habitat impact assessment is done in those instances. The same level of protection is provided as with land-based activities on sites of special scientific interest.

Recently, in relation to emamectin benzoate, we extended that process to include priority marine features and to recognise the species rather than a fixed place. Identification of a species in an area is particularly important, given that it is a medicine issue. That forms part of the assessment process for the controls that we put in play. The issue has become more self-evident over recent years. Some of the facilities that we referred to earlier have been established for quite some time, since the early stages of fish farming.

Claudia Beamish: I still do not understand your answer. How are activities monitored once they are happening, and is there the possibility of stopping activities if they are shown to be having a detrimental environmental effect? If so, what is that process?

Anne Anderson: With sea bed monitoring, we set a limit in terms of benthic, which is based on the information that is present at the time of the application. With MPAs, that assessment is undertaken under the habitat impact assessment process, which is a body of work under the Natura legislation. Any non-compliance with the benthics requires additional sea-bed monitoring. Most commonly, we have video evidence of the sea bed underneath farms. A staged approach is then taken in that process. Clearly, if there is an impact, we have the ability to adjust and/or revoke licences.

The Convener: Are there any examples of licences being revoked in those circumstances?

Anne Anderson: I am not familiar with that, but I will check. We have certainly reduced the quantity of impact from farms when we have had failing benthics. As a regulator, it is a very common approach to pull back. I am not aware of the specifics of that, but I will ensure that I capture that information and provide you with it.

The Convener: You say that a farm might be scaled back in what it is allowed to do. I am interested to know how often that has happened and whether there have been instances where a licence has simply been revoked because of the impact that was identified.

Anne Anderson: I am not familiar with any having been revoked, but I will provide you with accurate detail on that.

Claudia Beamish: Will you also provide information on whether there is a power to revoke?

Anne Anderson: Yes.

Claudia Beamish: Thank you. I will move on to sea lice. From the SAMS report, I highlight for the *Official Report*, as I did last week, that sea lice are

"a key impediment to the expansion of the Scottish salmon farming industry in the marine environment."

That is from the peer-reviewed scientific research that, as a committee, we commissioned.

You will have heard today's announcement by David Sandison about the real-time public reporting of sea lice data, which was introduced in the aquaculture bill, but not accepted. The bill became the Aquaculture and Fisheries (Scotland) Act 2013.

Do you have any comments on the real-time reporting situation and whether there are benefits to the reporting being publicly available? If those comments are in relation to disease or research, that would be helpful.

Anne Anderson: Any publication of information in that area is important for the ability to be transparent. SEPA publishes any information that it receives on the "Scotland's aquaculture" website, so that any aspect of it is accessible for R and D work. That is a beneficial move that the industry has chosen to take. The information around sea lice, sea lice mapping and locations relates to the interdependencies that I mentioned earlier. Being better informed can only be a good thing.

Claudia Beamish: Before we move on, I should also have posed the question to Anne Anderson about whether that should be a legislative requirement of the industry.

Anne Anderson: Yes, if it is consistently provided. That is the key point. If we believe that there is a need for it, a regulatory control is required to be applied because, as was pointed out, the Scottish Salmon Producers Organisation does not represent the entirety of the Scottish industry. Given that we are talking about the entirety of the impact on an industry in Scottish waters, it is relevant that all the information should be available at one time to add weight to R and D work.

Claudia Beamish: Are there further comments on that particular aspect of the sea lice issue?

Mark Harvey: The publication of the data is very welcome. I am commenting because we represent a local demographic and the public accessibility of our work is part of our day to day. It could make a big change to our work because it has always been a frustration that information about sea lice numbers was difficult to come across, certainly on a site-by-site basis. If that information is to be available, one can expect to see a great deal more public comment on it and, as a local authority, we will have to be ready to handle such comments.

The other point that I want to make is that the publication effectively answers one of the questions that our use of environmental management plan conditions has been aimed at answering, which was to allow the authority access to site-specific information on sea lice. Due to sensitivity about FOI and so on, we tried to work out arrangements to receive that information face to face, so there was not a huge exchange of information. I hope that that will now not be necessary and that it will allow the focus of the EMP to move on to the issue of wild fish monitoring, which is the other aspect of it.

Such openness in the planning system is a good thing, full stop. The publication of the data should be statutory, to enable regulators such as me to rely on it without getting into unnecessary arguments and costly requests for further information and so forth.

12:45

Claudia Beamish: Does anyone else want to comment?

Rob Raynard: Good access to data is important for the research and for the provision of advice from the research, about planning and so on. It is not just about real-time data, although I can see that that might be of interest to local authorities and others. Researchers often look at long-term data sets and want to be able to compare fish data with sea lice data, so the availability of historical data is strategically important.

Our current approach is to work in collaboration with the industry on the availability of data. To a large extent, that has worked quite well, but there have been occasions when it has been a bit more difficult, as Mark Harvey said.

In addition to the work that David Sandison talked about, the strategic farmed fish health framework working group has a focus on the availability of data in general. I guess that we do not mind how the data is made available; it seems that availability is improving.

Claudia Beamish: I have three questions about sea lice, which I will ask all at once. Please do not feel obliged to answer if the questions do not fall within the scope of your expertise.

First, Mark Harvey has touched on the potential impact of sea lice on wild salmonids. Should the issue be removed from planning and dealt with through a separate regulatory process? Such an approach is being considered, but is it of any value?

Secondly, how is the duty in the Nature Conservation (Scotland) Act 2004 discharged with respect to salmon farming? The panel knows this, but I say for the record that under the 2004 act all public bodies are required to further the conservation of biodiversity.

Finally, do the panel members have comments on the appropriateness of the triggers for the reporting mechanism in relation to sea lice?

Rob Raynard: On the triggers, for the first time, in essence, there is a need to report sea lice above a certain level, which is an average of three female lice per fish. There is also a statutory intervention level, which is eight lice. In view of the purpose for which the triggers are designed, which is to enable the industry to avoid big peaks, they are appropriate.

The basis for the levels comes from discussions with the industry about its experience of lice getting out of control on individual farms. The industry has found that it is important to keep the number below three; when levels increase above that there is a risk of the numbers escalating on the farm if no plan is in place. The new measures allow a plan to be put in place, and fish health inspectors monitor the outputs of the plan and can take enforcement action if results are not delivered.

Claudia Beamish: On the trigger levels in the new sea lice policy, the SAMS report says:

"there is no published scientific account of the basis for ... setting these levels."

How were the levels decided, and why do they differ from the levels that are in the industry's code of good practice?

Rob Raynard: You are correct that the basis is not published. When the data that the industry provides through the SSPO's reporting areas is modelled, the level of three female lice per fish emerges as the upper mean level, which indicates that the levels are acceptable in most of the industry. The requirement under the law is to have in place measures for the prevention, control and reduction of sea lice, and we felt that staying below three female lice per fish demonstrates that such measures are in place.

The graph that I spoke about fits with the decision to go for the level of three. It is not based on pure science, if you see what I mean; it involves a kind of adaptive approach. It is obviously bedding in, and we have agreed to review it after 12 months, which will be in July this year. As a result of the analysis that we have done of the industry data, we have a Scottish model, which we are about to publish. It was therefore not available to SAMS, which focused on the peer-reviewed literature.

The level of sea lice goes up and down depending on the season. The seasonally adjusted level at the moment is the lowest that it has been for the past three years. Three years ago, the average national level was about 2.5 female lice per fish, and it is now about 1. Of course, the measures that we have in place are aimed at ensuring that individual farms do not lose control.

I should point out that numbers in the SSPO's code of good practice—0.4 and 1—are not limits that are set by the SSPO or us; they are the level at which veterinary intervention should be sought.

Claudia Beamish: Does anyone have any other comments?

Mark Harvey: Again, the planning authority view is slightly different. You have mentioned the biodiversity duty, which is very much at the forefront of the minds of planning authorities when it comes to the protection of wild fish in respect of sea lice. We continue to emphasise the fact that, in taking a positive planning decision, we are addressing that biodiversity duty as well as we

possibly can. There is room for debate around that.

With regard to triggers, your first and third questions come together in that respect. The issue of triggers is a good example of why these matters are best left in the planning realm—that should not be exclusively where they are dealt with, but it is important that there is local control. It seems to me that the assessment must be conducted on a site-by-site basis.

In my area, we have SAC rivers, which means that they are protected. Some are protected because they are important salmonid breeding areas, and some are protected because they contain freshwater pearl mussel populations that rely on salmonids to distribute the young mussels. Clearly, when we consider planning decisions, there are sites of greater and lesser sensitivity. It is therefore appropriate that we should be able to apply tighter control over sea lice numbers in some areas and perhaps less tight control in other areas. It is not necessarily appropriate to have one figure for all sites.

We can address the issue of wild fish at a later point.

Richard Lyle: I have two questions, but I will try to be brief. There is a desire to double our salmon production but, as I and others see it, we have two problems: a fish mortality rate of over 20 per cent and fish escapes, with over 2 million fish having escaped in the past 15 years. People might say, "Och, it's only 147,000 a year," but it is 147,000 too many. Does a fish farm face any regulatory consequences if fish escape? Do fish farms report escapees to anyone at present?

Rob Raynard: Reports of escapes are provided to fish health inspectors. There is a requirement in the Aquaculture and Fisheries (Scotland) Act 2013 for businesses to report an escape or even the suspicion of an escape. There is also a requirement for farmers to have in place measures to prevent and control escapes. Following an escape, fish health inspectors will visit a farm to investigate and will consider whether there has been best practice on containment. At the moment, much of the inspection is focused on the elements of the code of good practice, which is considered to be best practice, and on record-keeping elements that are required by statute. As David Sandison mentioned, a Scottish containment standard is being developed and could be implemented in future to make things more robust. However, the inspectors will take enforcement action, depending on what they find.

Richard Lyle: Are farmers fined after losing fish, or are they just told that they must try to do better?

Rob Raynard: There is no fine for escapes in Scotland. The measures in place under the 2013 act mean that an enforcement notice can be issued, and not complying with that notice is a criminal offence. However, many of the issues that are found are dealt with through written correspondence.

Richard Lyle: So no one is taken to court.

Rob Raynard: No.

Richard Lyle: Okay. I will move on.

The Convener: I have a point of clarification in order to assist with this line of questioning. Is the total of 140,000-odd fish that escape each year indicative of a widespread problem, or is it mostly made up of a small number of large-scale escapes?

Rob Raynard: The large-scale escapes tend to be associated with extreme storms—the sort of storms in which people often end up dying in Scotland. We do not want any of that to happen, but it occasionally does. The data for the past three months shows that five escapes were reported, one of which had six escapees, one had about 1,600 and two had zero, because just a suspicion of escape was reported, which could have been because a small hole was found in a net. The nets are frequently inspected and, if a small hole is found, it is reported as a suspicion of escape. In the other reported case, 500 fish escaped.

The Convener: So it is pretty varied.

Rob Raynard: It is varied.

The Convener: There are quite a lot of incidents, given what you have said to us.

Richard Lyle: It is a small amount, but widely varied. What monitoring and research has taken place to understand levels of introgression in Scotland? Does more need to be done in that area?

Rob Raynard: Marine Scotland is exploring the development of a regular system of national assessment for introgression. There has been research on introgression in Scotland, which was included in the SAMS report. However, the report does not mention that the research has been hindered by past practice. It does not happen now but, historically, some farmed fish were deliberately released into rivers for restocking purposes. Because those genes are present from that historic activity—it is not really related to escapes—it is much more difficult to develop the genetic tools that are needed, but Marine Scotland has an assessment in place to look at that.

Richard Lyle: Okay—thank you.

13:00

Stewart Stevenson: I have a quick question, which I suspect will have a quick answer. Do the Government and any of the regulators have a role in regulating farmed salmon food? I see a shaking head.

Anne Anderson: It depends on the scale and size of the feed processing plant. We have feed processing plants in Scotland that are required to have a permit under pollution prevention and control legislation, and there are areas within that that pertain to raw materials and resource efficiency.

Stewart Stevenson: Would that address the issue of sustainability and influence the balance between sea-based product and vegetable product?

Anne Anderson: It certainly allows the potential to have those discussions. To date, they have not taken that route, because it has largely been a resource efficiency issue to do with energy, water and other materials. However, it will feature in our approaches going forward.

Stewart Stevenson: So we have the powers but we are not yet using them.

The report that was done for the committee says a number of things. I will read out the list:

"Additional regulation of shooting could improve seal welfare, e.g. through the reintroduction of closed seasons for shooting corresponding to the main nursing periods for seals. Validation of shooting reports, and additional post mortems on shot seals could increase the proportion of 'clean kills'."

Do any of the panel members see a need to act on any of those issues?

James McKie: Yes. It is important that we always maintain the clear position that the shooting regulation or the legislation was brought in to reduce shooting. The facility to put in place restrictions to protect the population is available in the regulations, and conditions can be applied to licences to restrict shooting during periods of concern such as breeding seasons.

Stewart Stevenson: Thank you.

Finally, on ADD noise-related pollution, is there a case for better monitoring and licensing?

James McKie: Absolutely. I note the interest in the subject earlier today, and one can tell from the discussions that there are quite different opinions. That sometimes makes it rather difficult to bring common theories into place. However, the bottom line is that the SAMS report identifies the necessity to do some more work on the matter, and we agree that that is important. Marine Scotland as an entity has a desire to pursue that, and we will work collaboratively with Scottish Natural Heritage.

The most important thing is that decisions on whether there is a requirement to regulate need to be based on good evidence, so we have to be able to collect that. There are some pretty good bits of evidence out there, but they are quite different, so you need to be able to take a balanced view, which is difficult to do, in order to make proportionate decisions. You also need to look at what you might restrict in the future if you take that route.

At this point, we have not lost sight of the necessity to give the matter rigorous consideration, and we will work towards getting ourselves to a place to make a decision.

Stewart Stevenson: Who has the lead? Is it Marine Scotland or SNH?

James McKie: Marine Scotland would work collaboratively with SNH. SNH is important to that decision making, as are others such as the sea mammal research unit and Marine Scotland.

Stewart Stevenson: Forgive me. Who has the lead?

James McKie: Presumably, we will take the lead on that. We would expect to do so at the moment.

Stewart Stevenson: That is fine. Thank you.

Mark Harvey: May I come in on that?

Stewart Stevenson: Yes—I beg your pardon.

Mark Harvey: I just add that the issue of ADDs was rather thrust on us in the past couple of years. My general area of work is Skye, and the waters surrounding Skye are now a candidate SAC for harbour porpoise, so it immediately became a much more important material consideration for us.

Our response to that is to put a condition on any permission that is granted to require the operator to retain a log of ADD use. More importantly, as a result of discussion with SNH, which may need to look retrospectively at the existing use of ADDs on farms and potentially take action by requiring adjustments to the way in which they are used, we have been considering whether particular equipment can be tuned—obviously, we are talking about sound frequencies underwater—to affect seals but not harbour porpoise and other cetaceans, for which there is a similar problem. At the planning application stage and subsequently through the compliance with the condition, we are trying to control ADD use. Obviously, the existence of an SAC makes it a pressing issue for us.

Stewart Stevenson: I do not want to open up a huge subject, but I presume that you monitor noise at the torpedo range adjacent to Skye and the SAC anyway.

Mark Harvey: Yes, although we are not trying to feed that information in at the moment.

Stewart Stevenson: That is fine.

Mark Ruskell: I have a question for Mr McKie about the regulations that allow the killing of seals in Scotland. My understanding is that those fall foul of the United States Marine Mammal Protection Act, which

"Prohibits the intentional killing or serious injury of marine mammals in all fisheries."

As a result, we could face an export ban on not just Scottish salmon but all our fisheries products in four years. What is Marine Scotland doing to address that? Are you considering withdrawing the regulations that allow the intentional killing of seals, or are you lobbying Mr Trump to try to change that act?

James McKie: We are tackling that issue directly. The matter is being dealt with by part of Marine Scotland and part of the wider Scottish Government to understand exactly what it means, what is required and what the expectations are. That consideration will feed into the way in which we react from a regulatory perspective. We do not yet know exactly where we are going with that.

Mark Ruskell: How much concern is there on the issue? The US act applies to any regime that allows the

"intentional killing or serious injury of marine mammals".

Intentional killing is what we have in relation to seals—we have a licence regime for that. Whether serious injury is caused by ADDs or other techniques that may scare away marine mammals is another question, but it is clear that we have intentional killing.

James McKie: From my perspective, I am at the sharp end, and there are people who are sitting behind that. The issue is a concern and it is being treated as such. Discussions are under way to try to verify the issue and consider exactly what it means. Obviously, that will help to feed into the decisions that are made.

Mark Ruskell: What is the timescale for that? If the salmon industry loses the US market, I imagine that that would be pretty chunky.

James McKie: I appreciate that point. I do not know the answer to that. Clearly, we would need to get back to you on the timescale.

Mark Ruskell: Could you write back to the committee on that, through the convener?

James McKie: Yes—no problem.

Mark Ruskell: That would be useful.

Finlay Carson: Given the likely increase in the use of wrasse as a cleaner fish, is there any need for additional regulation to deal with any impact on wild fisheries?

Rob Raynard: Marine Scotland is holding discussions with all stakeholders in the industry and fishermen as to what management needs to be put in place. We are obviously serious about the need to protect the environment, given the numbers that are being taken out. We know that the fishery in south-west England is managed sustainably. We have already licensed the fishermen and required data collection from landings. That important data will be put into the subsequent management of the fishery. Discussions are happening this month to decide what needs to be put in place before the fishery starts in April.

The Convener: Finally, Alex Rowley has some questions on mitigation.

Alex Rowley: It is just a quick question, convener. In its submission, Fisheries Management Scotland said that

"The regulatory system for the salmon farming industry is unusual in that there is no formal requirement for pre-application or post-consent monitoring of wild fish",

although there is for many other developments. Why is that, and does the situation need to be changed?

Mark Harvey: With regard to post-consent monitoring, I would go back to the environmental management plans that we have started to introduce in planning applications. That is as far as it has got. However, from a planning authority point of view, the answer, I think, would be yes, there is a need for post-consent monitoring. These are unusual planning permissions; although they are permanent and last for ever, they can go through different cycles. It is not like granting planning permission for a building, where you can pretty much work out what it is going to do—it is just there. These things are active and, as a consequence, should be subject to on-going monitoring. I am not claiming that the EMPs are the perfect tool, but they are moving in that direction.

The Convener: We have a final, final question from John Scott.

John Scott: You might have heard me discussing the possibility of engineering solutions for scooping up and gathering the detritus below fish farms and, as a possible development, the scooping up of waste. Are engineering solutions part of the answer to, or the way forward in dealing

with, these deposits, which get placed on sea beds and might carry the attendant risk that we have highlighted?

Anne Anderson: You are absolutely correct—there is a range of solutions. We have heard about complete containment, but many steps can be taken before we get to that point, and we have been looking globally at the sort of thing that you have suggested. A colleague has recently returned from the Tasmanian project that Sam Collin mentioned, which is very much centred on capturing as much of the detritus as possible. It is definitely something to consider for the future.

The Convener: Given that you have done that work and are obviously sighted on the issue, has anyone considered the point made in the previous session about the increase in the carbon footprint as a result of moving to closed containment in the onshore rearing of fish set against the environmental benefits of that approach?

Anne Anderson: We are looking at that at present. I referred earlier to SEPA's sectoral regulatory approach for fin-fish farming, and we are looking at all activities from the generation of the egg through to the final product that will go on our plates. As part of that, we are assessing these new technologies, and the question whether they are actually just substituting one pollution problem for another is very much a feature of that assessment.

The Convener: Does anyone wish to comment?

Mark Harvey: I suppose that the point about sustainability and the environmental impact of one approach over another is that it all depends on how sustainably Scotland can produce the electricity that it runs on. It is a relevant question, but it relies on other matters. Land-based containment raises a bit of a planning problem, because it is land hungry and the installations that we are talking about are quite large. I do not think that any planning authority could guarantee that it would immediately be able to identify enough sites for it, which, in itself, raises an environmental issue.

The Convener: If I remember correctly, the report says that each site would effectively require its own sewage treatment plant.

Mark Harvey: It is technically feasible, but it requires energy to drive it.

Anne Anderson: With regard to future sustainability, there has been some early research on the use of hatchery waste. SEPA has been involved in a project with industry and other partners to identify suitable and sustainable uses of such waste, and one element that will be considered is the detritus that falls from the bottom of the cages. Work is under way with that very aspect in mind.

John Scott: I am interested in the idea of a ladder going from where we are up to, ultimately, land-based solutions, but there are a lot of steps in between and I think that they should be investigated.

Anne Anderson: A range of different products is being trialled globally, and there have been discussions in Scotland about their use. This is also a location issue, and the need for flexibility and different solutions for different locations are absolutely fundamental considerations in those conversations.

The Convener: I thank both panels for the evidence that they have given today. At its next meeting on 20 February, the committee expects to consider a draft report on air quality in Scotland.

We now move into private session, and I ask that the public gallery be cleared, as the public part of the meeting has come to an end.

13:16

Meeting continued in private until 13:45.

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