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Proof Committee Hansard

SENATE

RURAL AND REGIONAL AFFAIRS AND TRANSPORT LEGISLATION COMMITTEE

Oversight of Fisheries Research and Development Corporation and National Carp Control Plan

(Public)

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SENATE

RURAL AND REGIONAL AFFAIRS AND TRANSPORT LEGISLATION COMMITTEE

Monday, 25 June 2018

Members in attendance: Senators Brockman, Colbeck, O'Sullivan, Patrick, Sterle.

WITNESSES

LIGHTEN, Dr Jackie, Private capacity

MARSHALL, Dr Jonathan Marshall, Private capacity

Evidence from Dr Lighten was taken via teleconference—

Committee met at 17:15

ACTING CHAIR (Senator Sterle): On behalf of the Chair, Senator Barry O'Sullivan, I declare open this public hearing of the Senate Rural and Regional Affairs and Transport Legislation Committee. As per standing order 25(2)(a), the committee is hearing evidence relating to the National Carp Control Plan and the potential release of the herpes virus in carp. I welcome you all here today. This is a public hearing and a Hansard transcript of the proceedings is being made.

Before the committee starts taking evidence, I remind all witnesses that in giving evidence they are protected by parliamentary privilege. It is unlawful for anyone to threaten or disadvantage a witness on account of evidence given to a committee, and such action may be treated by the Senate as a contempt. It is also a contempt to give false or misleading evidence to a committee. I would like to remind international witnesses that the protection of parliamentary privilege in the Australian parliament cannot be guaranteed to jurisdictions outside of Australia. Your evidence shall be made knowing the inability of the Australian Senate to protect you outside of Australia.

The committee prefers all evidence to be given in public, but under the Senate's resolutions witnesses have the right to request to be heard in private session. It is important that witnesses give the committee notice if they intend to ask to give evidence in camera. If a witness objects to answering a question, the witness should state the ground upon which the objection is taken. The committee will determine whether it will insist on an answer, having regard to the ground that is claimed. If the committee determines to insist on an answer, a witness may request that the answer be given in camera. Such a request may, of course, also be made at any other time.

Finally, on behalf of the committee, I would like to thank all those who have made the effort to be here today, whether via teleconference or in person. The committee is greatly appreciative of your participation. I welcome Dr Jackie Lighten, from the University of Exeter in the UK, and Dr Jonathan Marshall. Do you have anything to add to the capacity in which you appear today?

Dr Lighten: I am appearing today as an independent research scientist.

ACTING CHAIR: I invite both of you to make an opening statement before the committee asks questions. Dr Lighten, do you intend or wish to make an opening statement?

Dr Lighten: Actually, my comments have been enrolled into the opening statement of the other witnesses, so, to save time, we can include my comments that way.

ACTING CHAIR: Dr Marshall, do you wish to make an opening statement?

Dr Marshall: Yes.

ACTING CHAIR: This is your chance to tell us everything you think we need to know.

Dr Marshall: Thank you for seeing me today. It is a pleasure to be here. I am an aquatic ecologist by profession. I have over 25 years experience working as an aquatic ecologist, largely in the rivers, streams and wetlands of Queensland. In this capacity, I have some concerns about potential plans to use carp herpes virus, cyprinid herpesvirus 3, as a biological control agent for carp in Australia.

Over my career, one of my foci for research has been the ecology of the intermittent dryland rivers of southern inland Queensland and northern New South Wales, and I think these are of particular concern with respect to the carp herpes virus. The concerns that I have can be summarised into three main themes. Firstly, there is uncertainty around the efficacy of the virus as a biocontrol agent. Secondly, there is uncertainty and a lack of knowledge of the actual benefits that carp biocontrol would grant to native freshwater biodiversity in Australia. Thirdly, there is uncertainty concerning the actual risks of unintended impacts from the release of a virus such as this.

I have provided you with written material outlining some of these issues in a little detail, and, of course, I am happy to discuss those with you today.

ACTING CHAIR: Dr Marshall, for the benefit of the committee and others: this was supplied to us earlier. Are you happy to table that document so that we can refer to it and put it out there in the public arena?

Dr Marshall: Yes, I am.

ACTING CHAIR: Thanks, Dr Marshall. Carry on.

Dr Marshall: Overall, the main points that I'd like to make today are that I don't think we actually need to rush into this decision about whether to use the virus or not. There is a tendency to think that if we don't act now

things are going to get worse, but it's important to realise that, where they may exist, the impacts that carp have on Australian native biodiversity are relatively static, with carp having expanded into their major current range decades ago. In other words, the problem isn't worsening. Likewise, I believe the potential of the herpes virus to act as a biocontrol solution would not diminish if the decision time frames were extended. In a nutshell, there's no rush. We have time to better understand the problem and to arrive at a good science-based decision.

Large and complex problems such as this require a large investment and sufficient time for the science to be conducted to a satisfactory level. Releasing a virus into Australia is an irreversible act, and, while the benefits could indeed be tremendous, the potential for unintended harm could also be quite large. The problem is that we don't know which way this will go. In my view, the magnitude, the uncertainties and the risks around this situation warrant a longer term research program beyond the current National Carp Control Plan commitments, otherwise any decision made to either release or not release the virus would be made under a heavy shroud of scientific uncertainty.

ACTING CHAIR: Thanks, Dr Marshall. Quickly browsing over 'who are we' in the document you've supplied, we have some pretty serious heavy hitters here. Why aren't you at the table?

Member of the audience interjecting—

ACTING CHAIR: Oh, you're coming to the table later. That's great. Tremendous. Thank you very much. Where else in the world has this virus been released into the wild?

Dr Marshall: The virus has never been deliberately released into the wild anywhere in the world. It's actually a notifiable disease by the World Organisation for Animal Health. In most places in the world where the virus has turned up there have been concerted efforts to try to control its spread and eliminate it.

ACTING CHAIR: Why?

Dr Marshall: Because carp are a valued resource as an aquaculture culture species in most parts of the world other than Australia.

ACTING CHAIR: Obviously it works then if the virus gets into the wild?

Dr Marshall: Most of the large mortality events have occurred in aquaculture-type situations where—

ACTING CHAIR: Not in the wild?

Dr Marshall: There have been some deaths in the wild, but the mortality rates have been much lower and the long-term effects of those have been minimal. A lot of the big well-publicised high-mortality events have occurred in aquaculture settings where the fish are stressed, inbred and their immune systems are probably somewhat compromised.

Senator BROCKMAN: Where is this virus naturally occurring? Everywhere else in the world?

Dr Marshall: It may even be in Australia; we don't know for sure that it's not. Herpes viruses are very stable in their hosts. This virus has evolved with carp over millions of years, and it's only really become a problem in causing disease with the advent of—

Senator BROCKMAN: Fish farming.

Dr Marshall: big fish farming, where the fish are under particular conditions that promote it.

Senator BROCKMAN: In that fish-farming environment, how does the disease manifest itself? Is it an outbreak that suddenly explodes from nowhere, or is it something that is always present—is endemic—but not causing major problems? How does it manifest itself?

Dr Marshall: I am certainly not an expert on the aquaculture setting, but in the wild there have been studies, particularly in North America, where they've shown that disease outbreaks can be very localised and very short-lived, and not repeated in subsequent seasons. Basically, there's a mortality event at a localised position, somewhere between 20, even up to 60 per cent of the individuals who contract the disease die, but then the following year that doesn't happen again; the population has developed an immunity to the disease.

Senator BROCKMAN: But it's endemic in pretty much the rest of the world. Is that correct?

Dr Marshall: It's throughout Asia, it's throughout North America and it's in South Africa, but it's not everywhere. It may be in Australia but we don't know for sure.

Senator STERLE: Can I be clear on that: we have scientific proof that it's very effective in the first cohort that it affects, but then the carp become immune to it. Is that what happens?

Dr Marshall: There's uncertainty surrounding what happens in wild carp, because most of the studies haven't been done in wild carp. But we know that there's genetic variability, which gives wild carp a greater chance of

surviving the virus than inbred, aquaculture carp. And we also know there are particular genes which are associated with resistance to the disease, and we don't know the prevalence of those genes in the Australian carp population. This is one of the uncertainties that I'm highlighting to you.

Senator STERLE: My shorthand is not as quick as your talking—and that's no slight on you; that's my poor shorthand—but I got the third point, and this will be a tricky one: you talked about the unintended impacts. Could you give the committee a greater overview on what we do know are unintended impacts, or what we think we might know? Or what should we know?

CHAIR (Senator O'Sullivan): Before we go to that, can I just exhaust the line of questioning we had before. We're about to release a virus into a species where—for want of a better term—we've got wild-catch prawns and farm prawns. Using those terms, wild-catch and farm prawns, what you're suggesting here is that the scientific testing has concentrated on farmed carp, if you like, versus wild carp. Is that correct?

Dr Marshall: Yes, and if I can just elaborate on that slightly: the virus is very difficult to detect if it's present but not propagating disease. So really, in most settings, it's in the diseased, dying fish, which are then analysed by fish pathologists and they find the virus present. But if the virus is present but not causing illness and mortality, it's very difficult to detect.

Dr Lighten: I can elaborate a little further on that. In the UK, we've had outbreaks of koi herpes virus over the last 20 years or so. These generally occur in flow systems—lakes that have been stocked with fish for the purpose of angling. Each year we get about 10 to 20 new outbreaks, which are transmitted in various ways between sites each year. I think in the last 20 years we've had one outbreak on a river system which will have wild carp—high genetic diversity—which have escaped from various different localities. So that could be down to the riverine ecosystem which is preventing the spread of the virus easily through the population—it may be that the population is dispersed over a large distance—or it may be down to the genetic diversity of the carp that are in those rivers, where we have a lot of mixing of individuals so we have a higher genetic tolerance, so to speak, for the disease—there's more resistance.

In the Australian system you also have a lot of genetic diversity in the carp. We don't specifically know about the immune genes, but overall the genetic diversity is quite large along the Murray-Darling system. You also have very high densities of carp there, so, if the release is concentrated on portions where the individuals are grouping together in large concentrations, there would almost certainly be a large outbreak. Whether or not that is a good thing or a bad thing is another question.

CHAIR: Let me put what exercised my interest to you, Dr Marshall, and you can tell me whether I interpreted what you said correctly. We're going through some baseline scientific work with respect to this, and it seems as though we have chosen cultured carp for the scientific work as a baseline as opposed to using wild carp, where there could be some genetic disparity between the two, meaning that we may not be able to rely upon the results in the cultured carp in terms of what's happening with the wild carp. This is just a yes or no because I will abandon this if—

Dr Marshall: No, the testing that CSIRO undertook in Australia was as part of the looking at potential disease in other species. They used wild caught carp from Australia for those tests.

CHAIR: Which would be the appropriate thing to do.

Dr Marshall: Yes.

CHAIR: Okay. I'm sorry, Glen; I misunderstood.

Senator STERLE: That's quite all right, because I'd forgotten where I was. Oh, yes: unintended circumstances or impacts.

Dr Marshall: I think there are two main uncertainties around this. The first one is really obvious: the water quality impacts of decomposing carp. The NCCP is currently running an anoxia program where they're using the biomass estimation from another project and they're modelling what the death of carp might actually do to the water quality. But the bit that's missing is the biological response of the native ecosystems to that work.

Senator STERLE: If you ever wanted to move home, I'll come in, pack it all up, load it, chuck it in a road train and get it to Darwin, and I won't break one single thing. I don't understand this sort of science. You've really got to make it simple. If the carp are infected and they die, do they float to the surface? Do they go to the bottom?

Dr Marshall: Some float. Some sink. They discompose. As they decompose, they strip all of the oxygen out of the water. In circumstances where there are not processes that put the oxygen back—like rapid flowing water puts the oxygen back. If you're in an intermittent river that is not flowing, there's no process to put the oxygen back other than diffusion, which is very slow. So the oxygen goes out of the water. There are models being

developed to simulate that as part of the current program, but the assumptions around what that actually does to the native fish and the native invertebrates that live there are not currently being tested. That's an area that I think is very important. Given the scale we're talking about—the whole of the Murray-Darling Basin plus other catchments—the feasibility of a manual clean-up operation at that scale is just something that seems very unlikely to be successful.

Senator STERLE: Chair, as for the time, I'm real happy for everyone to get a go, but we have someone else coming on the hook-up, I believe, and there are so many questions we need to ask.

CHAIR: I already formed the view that we—

Dr Lighten: I can add quickly to that water quality issue. Faith will be able to give you some very good information on that. She's an expert on that particular aspect. One other additional thing to realise is that, when these fish die, they profusely leak blood. There will be lots and lots of blood in the river as well. Faith has done some quick calculations, and she inferred that the quality of the water of the Murray-Darling Basin if this goes to plan would be comparable to sewage in terms of the levels of different nutrients in the river. That's something also to bear in mind.

CHAIR: While you're on the subject, could you touch on the prospect of botulism? Could you tell us in a minute or two? I understand how botulism occurs, but what if we had a flow event? Do you know what the life cycle of botulism is and whether it can travel 100 kilometres downstream?

Dr Marshall: I can't really comment on botulism, sorry. It's outside of my expertise.

Dr Lighten: It's a little out of my expertise as well, but botulism occurs in the rotting fish, so, wherever these are decomposing, there is high potential for it to be occur. That could be spread by birds and other wildlife that contract it, and this can be passed on through the food chain.

CHAIR: More importantly, if properties along there are relying on stock naturally watering on the river or estuaries in the water, or if they pump the water out of the river to go up reticulated around 100 troughs over the next 40 kilometres, if botulism has a life that allows it to remain active until it gets into those farm system, we'll lose hundreds of thousands of head of cattle if that happens.

Dr Lighten: I'm not sure of the life cycle of botulism, but, as far as I'm aware, it would have some life cycle of some time period outside of a decomposing fish.

CHAIR: Thank you for that, Mr Lighten. Senator Sterle, how do you want to manage this?

Senator STERLE: I think there are going to be a lot more questions. We're going to be doing a couple of field studies. We're going to be talking to other sides of the equation. I think we'll do ourselves no justice as a committee, because we are booked till 6.30 and then there are other meetings going on because we're here till 10 o'clock tonight. We have other witnesses in the back of the room. We're going to have to bring them back, I think.

CHAIR: Yes, I think that's inevitable. I'm wondering how we manage the next seven or eight minutes of our time.

CHAIR: I will shut up and give Senators Colbeck, Brockman and Patrick a chance.

Dr Lighten: Can I make one more comment before you bring on the other witnesses?

Senator BROCKMAN: Go ahead.

Dr Lighten: This is mainly around the conduct of the NCCP. It's been common practice—and they have displayed this—that, when an international or national scientist speaks up against them, they have personally tried to attack them and drag them through the mud. There were previous comments from Matt Barwick about entitlement to comment on scientific points relevant to this and on motives. There's consistently relayed in the media and the Senate that I personally have an ulterior motive, that somehow I'm biased and have some vendetta against them and that all of the scientific points that have been published or made against them should be ignored. This is a very dangerous kind of way to go about things, because it tries to dejustify the scientific points and arguments that people are making. Especially when this is put out in the public domain, this can be extremely misleading, and the NCCP have continually made misleading and false comments and points to the Senate and to the public. I just wanted to make the Senate clear of that. For a real scientific debate, there needs to be the NCCP debating with people who are in opposition through a completely transparent process. At the moment, they have the media behind them. After the last Senate hearing, there was a newspaper article that said, 'Stop carping on, you whingers,' talking about the international scientists who just want to see a fair process and that the environment of Australia isn't irreversibly damaged. This is very unprofessional and disrespectful to those scientists around the world who have put years of work into studying this out of pure interest to discredit them just because they have predetermined rhetoric.

CHAIR: Rather than us examining that now, we'll be able to do a better job of that if we have material before us. Could you take on notice supplying us with any material that is relevant to that statement you have just made or, if you don't have that material, sufficient reference for our secretariat to be able to source it? Would you be able to do that?

Dr Lighten: I can put it all together. I can show newspaper articles where there have been completely false statements and things like that.

Senator BROCKMAN: Dr Lighten or Dr Marshall, do you believe that the carp control program as currently set up is underestimating the risk of cross-species transfer or are you more concerned about the direct environmental impacts?

Dr Marshall: I'm personally more concerned about the direct environmental impacts. I'm not a virologist, but I've spoken to lots of virologists and asked them this very question. Herpesviruses in general are very host stable. There's a lot of research from around the world as well as the research that has been done in Australia that suggest that the virus won't cause disease in other species, but that doesn't mean other species can't carry the virus and act as a transport mechanism between carp. That's not one of my major concerns, this cross-species mortality.

Senator BROCKMAN: Dr Lighten, did you have anything to add?

Dr Lighten: Yes. I agree that the direct environmental effects are the most worrying at this point. However, the infection trials which the researchers undertook are far from conclusive and far from satisfactory. Not only did they not attempt to replicate their results to determine the reasons why other nontarget fish—those another carp, trout and so on and so forth—died in such high numbers in those experiments and even showed clinical signs of gill necrosis, rotting of the gills, which is a classic symptom of koi herpes virus, but they also discounted infection in other non-species with inadequate justification, in my opinion.

Senator BROCKMAN: Did they give a reason for discounting that evidence?

Dr Lighten: They apparently didn't see replication of the viruses in the tissue, which I don't think they went into adequate detail to really investigate. The study is far from conclusive. They came up with some excuses like there was cross-contamination. In what is apparently the most biosecure laboratory in Australia, there was contamination between their experimental groups. It's worrying alone that the scientists are contaminating between experimental trials but also it's that other fish did show signs that were consistent with symptoms of koi herpes virus. They also conducted experimental trials at a water temperature that isn't representative of water temperatures that will occur when they aim to release this in the summer months in Australia, which will be around 30 degrees. They conducted the experiments at around 24 degrees, which is fine for the replication of this virus. At higher temperatures, apparently the virus may not work too well and fish can self-medicate by going to warmer waters if they're infected.

There's also the issue of higher immunocompromisation of fish at higher temperatures, where their gene expression changes and their immune system becomes lower. I spoke with a colleague who is friends with one of the leading experts of Murray cod. He gave an example where if you catch a Murray cod in 30 degree water and you pick it up then it will almost certainly die in your hands. I'm paraphrasing here, but it goes to show that the effect of the rise in temperature alone are making the fish more fragile. That is a major concern. They need to repeat these infection trails at higher temperatures to assess the efficacy of the virus and the immunocompromisation of the fish and other species as well. It may be that they become infected in higher temperatures or they move to cooler waters and have immunocompromisation and become infected. We just don't know. But the stability and host specificity of herpesvirus is strong, so they're mainly infecting carp with koi herpes virus. We just can't be certain at this point.

CHAIR: Are either of you familiar with a study that shows that the virus could infect fathead minnows?

Dr Lighten: Yes. I read some time ago that, in a cell culture, they found replication in fathead minnows cells, which was just stated by the other witness. Many species can spread this virus—molluscs, plankton, fish, birds—although it's debatable what is meant by 'a virus can live in something' because we don't actually know if a virus is living or not. But we know that, in these other fish, it may not replicate but it can reside for some time inside of the organisms. One of the unique features of this proposed release is that the population size of the fish and of the viral particles will be unprecedented compared to these natural outbreaks and in agricultural facilities.

A very important factor in driving the evolution of organisms is the population size. This gives a very high evolutionary potential and risk or chance of mutation being propagated through the population. Quickly, following on that point, this has always concentrated on mutations of the DNA. There are other mechanisms by which organisms can rapidly adapt even quicker than utilising mutations in their genome. Changes in gene expression can happen overnight in humans and everything. It's based on environmental conditions. It can change

the expression of particular genes. It can also be through DNA recombination. These are unpredictable events after cell replication which cause huge conversions, shifts and rearrangements of the DNA. There's no evidence to suggest that that has occurred so far in herpesviruses, but it's a very real possibility and it's unpredictable. There are more mechanisms by which this virus can potentially infect other species aside from just point based DNA mutation.

Senator BROCKMAN: I have one final question in the interests of time. Are either of you aware of any examples of using a virus as a biological control in this way that has been (a) successful and (b) with no adverse consequences?

Dr Marshall: Not in an aquatic environment, but of course there's the rabbit calicivirus and myxomatosis, which is well known in Australia. But, in an aquatic realm, no. The issues are very different.

Dr Lighten: There hasn't been a purposeful release of a virus in an aquatic environment. Rabbits are not comparable.

CHAIR: Firstly, let me apologise for the delay in starting, although it seems Senator Sterle got us underway. It is clear to me that I could spend an hour or more with each of you, and I'm sure that other colleagues feel the same. In the interests of keeping to the schedule, given there is no prospect of us being able to examine either or both of you and get a resolution to this, we will move onto the other witnesses who are scheduled, but I'll put you on notice that we'll be asking you to join us again in a much better-structured environment and for a much longer period of time.

Dr Marshall: I'm very happy to oblige.

CHAIR: I thank you both. Dr Marshall, safe travels back to your port, and same to you, Dr Lighten.

Dr Lighten: Many thanks for the invitation. I appreciate it.

CHAIR: Thank you. We really do appreciate it. Your voice has come a long way for us.

COLEMAN, Faith Siobhan, Private capacity

FALCONER, Mr Adrian, Private capacity

LOH, Dr Richmond, Private capacity

ROCLIFFE, Mr Martin, Private capacity

[17:49]

CHAIR: Welcome. Dr Loh may join us. I should have asked whether anyone wanted to make a short opening statement. Mr Falconer?

Mr Falconer: We'd like to thank the committee for meeting with us. As a group of scientists and citizens, we're deeply concerned by the proposal to use the carp herpesvirus to control Australia's most prolific aquatic pest. We support the concept of a national plan to address the problem of carp within the Murray-Darling Basin. They're now at densities 25 to 75 times higher than peak rabbit populations. We owe it to our children to minimise the impact of this species. That said, we must do so in a manner that does not risk more dangerous and unpredictable issues. Unfortunately, the politicisation of the Murray-Darling Basin seems to have impacted on the scoping and operation of this project. While the impacts will be felt throughout Australia, the majority of any potential benefits will be delivered to upstream water users while the majority of risks falls to those living in downstream communities—people already heavily impacted by disruption to our rivers, lakes and the Coorong.

Presentations by the NCCP team encourage listeners to believe that removing carp might restore macrophytes, turbidity and native fish levels to where they were in the 1920s, a time before river regulation, and this doesn't help with the public discourse. There are numerous research papers and historical records that clearly demonstrate these indicators were in decline long before widespread carp infestation. An early indication by the cotton industry lobbyists that carp control will result in a reduction in the need for environmental flows is also tainting the public discourse. Any responsible plan must weigh real risks against realistic benefits.

It's critical to recognise that the scientists presenting here today are not alone. There's a significant level of concern across the community. Recent polling across 99 community groups demonstrated 76 per cent opposition to the release of the carp herpesvirus. A follow-up poll showed that 84 per cent of those polled supported carp control where the virus is not used. It is also important to recognise that my colleagues and Dr Lighten have taken a significant economic, professional and reputational risk, particularly those of us who still work within the natural resources sector. It's not something that we do lightly, given ongoing attempts to discredit opposition voices. We believe it is critically important that facts and relevant research rather than opinion dominate this debate. Design of a plan around a predetermined solution is poor scientific policy and business practice. It leads to planners asking the wrong questions and indulging in selective use of science to justify, in this case, the use of a high-risk, irreversible and unpredictable biocontrol.

The current published proposal to not release the NCCP's own research reports until after public consultation has been concluded is also poor form. The CSIRO research used to define the scope of the NCCP appears to contain a number of technical oversights, leading to the development of conclusions that do not appear to be supported by the body of work described. We're happy to discuss these issues with you further in questions. While the current strain of the virus does not present a direct risk of infection to human hosts, the risk from secondary infection appears high and potentially recurring, and this includes a number of Third World waterborne diseases, including botulinum, aeromonas, poisoning from cyanobacterial toxins and life-threatening impacts from haemorrhagic E. coli.

The risks are not limited to infection or viral mutation. Knockdown controls used in water bodies always present a significant environmental risk with a pest in these densities. Recent discussion has suggested that clean-up might be restricted to a small percentage of affected waterways. Using the estimate of killing 80 per cent of two million tonnes, the simplest water treatment calculations suggest that we could see a biochemical oxygen demand resembling that of poor-quality, secondary treated sewage for all of the waters in the Murray-Darling Basin. If we saw those levels, the rotting fish would consume more than four times the available dissolved oxygen in the water, with lethal impacts for other organisms sharing the water body. The suggestion that we might look to perform a clean-up for only a small portion of priority areas presents very real dangers for total ecosystem loss. To have any chance of keeping nutrients within the set guidelines, without considering the already degraded state of the basin, 50 per cent to 90 per cent of carp biomass would need to be removed within 48 hours of death. Practical considerations and logistics render that prospect all but impossible.

From an ecological perspective, the use of knockdown biocontrol is a crude, symptomatic solution that overlooks safer and potentially more effective options in favour of lower start-up costs. In the last few years and

indeed the last couple of months, there have been significant improvements in our understanding of the Murray-Darling Basin and suggestions of far more effective and safer solutions, even while maintaining current levels of irrigation and water use. These solutions used in conjunction with manual removal of live carp and more sophisticated approaches such as single-gender genetic technologies could mean that we don't have to use an approach that carries such massive ecological and health risks. Rather than an approach requiring highways of trucks filled with rotting fish and producing a river not fit for drinking or recreational use, we could choose approaches that would leave our children with better waterways. Those waterways would maintain significantly reduced carp populations forever, and that's something that biocontrol simply can't deliver.

CHAIR: Thank you. None of the other witnesses wish to make an opening statement. You were in the back of the room when I asked the question about botulism.

Faith Coleman: Yes.

CHAIR: Let me ask you this question. I should know the answer myself. When we inoculate cattle with either a five-in-one or a seven-in-one, does it include an inoculation for botulism? Do you know?

Faith Coleman: I don't know. Is Richmond online?

CHAIR: Dr Loh, I should have recognised you. Can you hear us?

Dr Loh: Yes, I can.

CHAIR: Welcome. Do you know whether the traditional treatments of five-in-one and seven-in-one have an inoculation for botulism?

Dr Loh: I'm not sure that they specifically get the botulism vaccine for cattle. Quite a lot of cattle properties don't vaccinate for botulism.

CHAIR: So, if a botulism outbreak has occurred in the river system—you can answer the question about what happens next between yourself, Faith Coleman and Dr Loh—does it flow down the river or can it be reticulated in water supply to cattle?

Dr Loh: Cattle are highly susceptible to botulism. The fish will initially produce it. It only affects fish and birds. It will also affect humans, but, if birds eat the rotting fish and they subsequently die, they will likely produce botulism type B toxins. The type E kills cattle, sheep, horses and a whole heap of different birds.

CHAIR: What is the life cycle of this botulism?

Dr Loh: It's a soil bacteria. It's also in the guts of the animals. When they die, it is quite localised. It will stay in the sediment, but things like maggots, when they eat the carcasses, will concentrate the toxins. The birds will come in and eat the maggots or the rotten fish—

CHAIR: I appreciate that, and that's why we bury dead cattle as we can. I'm talking about the life of the botulism. It's in the river. If I were to pump water out of that to a holding tank, for example, that reticulated to four troughs that 500 head of cattle rely upon, will it live in the water for an hour, a day, a month or a year?

Dr Loh: I'll have to look up the stability of the toxin itself.

CHAIR: Faith Coleman can apparently assist us, Dr Loh.

Faith Coleman: Various forms of the botulism toxin have been used as a terrorism tool. You can extract the toxin and use it to put into waterways to poison populations.

Senator STERLE: How long does it last for?

Faith Coleman: It lasts for quite some time. I don't know the exact time; however, I do know it outlasts many of our water filtration systems, which take some days to go through. It lasts for a reasonable amount of time. It will degrade, but it will—

CHAIR: But does it need an organic host? If I pump it up into a tank and it goes down to the bottom of a turkey's nest or a tank, can it live there longer?

Faith Coleman: There are two separate things here. One is the toxin produced by the bacterium and the other is the bacteria itself. So the bacteria can survive in an aerobic sediment, yes. But what is of concern to those of us around the table is the toxin generated, which is separate. All you need is the bacteria. The toxin lives on beyond the bacteria.

CHAIR: In water? Does it need a water host?

Faith Coleman: It needs water, yes, as far as I know.

CHAIR: So will it kill birds or cattle where that toxin is?

Faith Coleman: Most bird kills that have been associated with botulism have been associated with fish kills, and those birds eating the fish. That is the most direct link.

CHAIR: We are about to do this on a massive scale.

Faith Coleman: I haven't seen a comparative scale to that. I am sorry.

CHAIR: But one would expect that it would be catastrophic to bird populations?

Faith Coleman: It could be. Many of the biggest bird kills in Australia have been attributed to botulism and fish kills.

CHAIR: If we take that water from the river and pipe it to troughs or tanks, if stock ingest the toxin, is that sufficient for them to become ill?

Faith Coleman: That would be a question for Richmond. He appears to be looking that up at the moment. I think some of the other concerns are equally as bad; things like haemorrhagic E. coli are quite dangerous to humans in very small quantities. Falling into wetlands down at Greenfields in South Australia caused several council members to end up in hospital due to haemorrhagic E. coli at the base.

CHAIR: So if we have botulism and we have a flush in the river and it moves down to where there might not be a massive population of dead carp but it gets to a swimming hole five or six kilometres down in a shallow with kids jumping into the river and ingesting water, is that a health risk to humans?

Faith Coleman: It is probably less the botulism and more the E. coli and some of the other diseases that would be an issue.

CHAIR: Tell me this and then I will move on, because these things make me cranky. The people that we have in charge of this project must know the potential of these things. This seems like science 101; does it not?

Faith Coleman: Absolutely. It is fundamental ecology.

CHAIR: They must know. They must either be ignoring it or they are themselves looking at trying to model up what the potential of this is.

Mr Falconer: The study that they have conducted, which relates to human health impacts, focuses primarily on the direct infectivity of the virus itself to humans rather than the secondary infections and so on. I believe that they have now slated potential additional research to cover those elements, but the study that's currently on the books was not designed to evaluate those.

CHAIR: My final question: what could ever be in their mind not to look at something in the risk profile as it would seem as evident of this potential? What could—

Mr Falconer: I would agree with you.

Faith Coleman: I raised the issue of haemorrhagic E. coli with the National Carp Control Plan staff 2½ years ago, or whenever it was that this started, at a meeting at Meningie. It was raised before the scope of the studies came out.

Senator STERLE: What was the response that you got?

Faith Coleman: That it was fascinating and we should talk more.

Senator STERLE: And?

Faith Coleman: And I have discussed it several times since. In fact, in my latest conversation, I raised this in the YourSay discussions online because I just wasn't getting an adequate response. I live on this river, you know. The response I got was a discussion about a study that the New South Wales Water Authority did in their reservoirs with some little microcosms, some little tanks. And because the tanks without a bottom deform, as we all know, they had to put a base in them. I was told by the researchers that this particular study had no access to sediment, and these are all sediment-borne diseases. That study was used to prove to me in an email that they'd done a trial, and none of these pathogens had been a risk.

Senator STERLE: This is in fish tanks?

Faith Coleman: Basically.

Senator STERLE: Aquariums?

Faith Coleman: Big water tanks with the bottoms cut out of them and put into a reservoir. They had to put a base into them, which I was told was a geotextile bladder of some variety and, because that's slightly permeable, apparently, they somehow had contact with the sediment. However, I'm yet to get a clear answer about that one. You either have contact with the sediment or you don't.

Senator COLBECK: Can I just start by getting a sense of the specifics of your particular qualifications—each of you—so I understand the evidence that you're giving to us from that perspective. Mr Falconer, you've got a Bachelor of Science in environmental biology?

Mr Falconer: Yes.

Senator COLBECK: Any particular specialisation in that?

Mr Falconer: No. I had a particular interest in aquatic ecology, but I am probably the least qualified of the people here today from that perspective. I've done a lot of research over the last few years into this subject, because I was concerned very early on about the process. But, my field experience is limited to some fisheries research and work on a trawler, and that's about it in terms of my direct employment.

Senator COLBECK: So what has been the core of your focus as part of your everyday work, apart from being interested in this and then delving into it, obviously, as part of this process?

Mr Falconer: My everyday work has been in the medical field in infection control and radiology in recent times.

Senator COLBECK: Fine. Ms Coleman—you've got a lot of letters there, and I can't interpret any of them.

Faith Coleman: I have a postgraduate qualification in GIS and remote sensing—mainly spatial statistical work; however, I have 20-odd years experience working in estuaries around Australia and internationally, looking at how to maintain their health and productivity.

Mr Rocliffe: My background is one of microbiology and biochemistry—more in medical diagnostics here in Australia and prior to that in the UK. One of my other interests over the last 20 years has been keeping koi carp. Although in itself that is not especially important, unfortunately, in that capacity I've come into contact with the herpes virus through knowledge in the UK, Europe and South Africa. I've seen what it does in the food-manufacturing carp environment, in ornamental carp and in various industries in and around the production of carp.

Senator COLBECK: So now I'm going to test my memory a bit here—

CHAIR: Dr Loh, our fourth witness is on the phone.

Senator STERLE: He's the fish vet.

Dr Loh: I've been working as a fish veterinarian and a veterinary pathologist for the last 16 years. I am a past president of World Aquatic Veterinary Medical Association, and I'm a certified aquatic veterinarian.

Senator COLBECK: Mr Rocliffe, my recollection of evidence that we heard at estimates was around the virus being very specific to a particular species—I did come in late, so I may've missed something, and I apologise for that. Are you saying that this virus isn't as specific but will move into other species of carp, or you've seen it impact in other species of carp?

Mr Rocliffe: The carp virus is fairly specific to carp. Koi are ostensibly a pedigree carp, so they are also affected by the virus. The basic history of the virus is that it started to emerge in the late 80s—probably early 90s. It seems to have come out mainly from the carp farms where carp were being manufactured or bred for food in Asia any maybe Israel. It has then cross-contaminated into the ornamental carp or the koi carp industry and then got into the wild environment. My experience is that in the UK it has affected many lakes where carp are a sport fish for anglers. As Dr Lighten said, there is at least one instance where it has got into a river and affected wild carp. But it has been more of an impact there in terms of the manufacture of carp for food and ornamental koi carp.

Senator STERLE: So from the fish farms.

Mr Rocliffe: That's right.

Senator STERLE: So in aquaculture effectively?

Mr Rocliffe: Exactly. It still is a problem. The virus exists naturally—for want of a better expression—in many countries, even countries where they have a problem not dissimilar to what we have here in Australia with the overpopulation of carp in rivers and lakes. You may well have seen images, particularly in North America, where speedboats are going through lakes and carp are literally jumping out of the water at them. None of these countries are considering using the virus to kill off those carp, even though the virus already exists in some areas in their natural environment.

Senator COLBECK: But are the carp a native species as well?

Mr Rocliffe: My understanding is that in North America that is an Asian carp that has got into their rivers and lakes there, and they are managing it in other ways. It is a different species of carp to what we have here. We have European carp.

Senator COLBECK: But is it native to North America as a species?

Mr Rocliffe: No; it was accidentally introduced.

CHAIR: Similar to our circumstances.

Mr Rocliffe: Exactly.

Senator BROCKMAN: So both the virus and the carp were introduced—at the same time?

Mr Rocliffe: I couldn't answer that question. My understanding is the virus probably started to spread through many countries from the late '80s onwards. How it got there—through the wild carp or through accidental introduction—I couldn't tell you.

Mr Falconer: I believe you were asking about the species specificity. While Dr Lighten would be the best person to ask about that, the risk is inherent in the possibility of mutation. What we know with certainty is that there are more than 30 strains of this virus already in existence. Bearing in mind that this virus only first came to light in the last 30 years, there are 30 strains in 30 years and each one of those represents a mutation. They have not resulted in a jump of species at this point, but mutation is a random event and unexpected consequences can occur. Just because the 30 mutations they've seen so far haven't caused a species jump does not eliminate the possibility of that occurring in the future. It is fair to say that it's a fairly species-specific virus, but you cannot eliminate on an evolutionary time scale the possibility of that occurring.

Senator COLBECK: I think that is a fair statement. Going back to Mr Rocliffe's comment about them not using the virus in the US, where he says the infestation is an Asian carp, my understanding is that the virus doesn't impact on the on Asian carp.

Mr Rocliffe: It does impact on any species of carp—Asian, European or koi.

Senator COLBECK: So it is not specific?

Mr Rocliffe: It is specific to carp as a genus and within that genus you have European carp, Asian carp and koi carp.

Mr Falconer: There is some difference of opinion within the scientific community and there hasn't been enough study, I would suggest, to determine that. There were some studies that were done in the past which showed the possibility of the virus operating in goldfish. At one point that was dismissed, and then later on another study was done that said that it had actually occurred. So it's an area where there's—

Senator COLBECK: Goldfish being another species of carp?

Mr Falconer: They are. But there's a fair jump between the two.

Senator STERLE: Chair, can I just ask—sorry, Senator Colbeck, for cutting in. So we're the only nation—

CHAIR: Sorry, I think Dr Loh is trying to make a contribution. Dr Loh?

Dr Loh: The virus has been shown to be effective in the *Cyprinus carpio* species. The ones that you see jumping out of the water are probably the silver carp, *Hypophthalmichthys molitrix*. I believe they are not susceptible to it. Data from the transmission trials by the NCCP actually showed higher mortalities in the non-target species than in the carp they were trialling themselves.

Senator STERLE: Well, that's new.

Dr Loh: I don't believe this has been published in a peer-reviewed journal. Also there were a couple of instances where, say, silver perch were injected with the virus and they found the virus PCR in the gills. They gave the Murray cod a bath and then they found the virus in the kidneys. This tells me that the fish has actually taken on the virus and circulated it systemically. In terms of the mortality, it's very high. With the normal carp that's captured in the wild, in a bath experiment the mortality rate was between 65 per cent to 80 per cent; silver perch was 35 per cent; Murray cod was 24 per cent; golden perch was 42 per cent; galaxias was 82 per cent; and rainbow trout was 43 per cent. In the injected ones, the carp mortality rate was between 40 per cent to 75 per cent; silver perch was 65 per cent; Murray cod was about 35 per cent; golden perch was 37 per cent; galaxias were too small for injection; and the rainbow trout mortality rate was 100 per cent.

Senator STERLE: Struth. That's thrown a spanner in the works.

Dr Loh: To me, that data looks like the koi herpes virus is probably protective to carp but killed other species.

Senator STERLE: Could we get that table? Where can we get those figures?

CHAIR: Dr Loh, could you take on notice to provide the committee with—you made reference to some work that's occurred there. If any of it has been published or if there is any data available, could you make that available to the committee? That offer goes to each of the witnesses.

Mr Falconer: That study, or at least that data, is available publicly in online sources. It's not discussed in detail in the abstracts, but he's referring to the actual results which are deeper in the study.

CHAIR: Would you be kind enough to give the secretary the reference points so that they could find that?

Mr Falconer: It's referenced in our submission.

Senator COLBECK: Can I just ask a final question: is it determined that the deaths were caused by the virus?

Mr Falconer: In that particular study, which is really a cornerstone study for all of the NCCP, they did not determine the cause of deaths in those natives. They stated that, under the criteria that they had selected for determining infection, the fish were not infected and, therefore, couldn't be affected. But the problem with that conclusion is, as Dr Lighten suggested, many of those fish displayed carp herpes virus-like symptoms, but were not tested to find out what actually caused the deaths of those fish; they simply stated that it could not have been the virus because it did not reach the infectivity thresholds that they had determined.

CHAIR: So we don't know what killed them, but it wasn't the virus?

Mr Falconer: That's the gist, yes.

Mr Rocliffe: I think one point to make about that is that, even if you were to accept the premise that it was not the virus that killed the natives, the best that you can get out of that argument is that, if fish—that is, the natives in this experiment—died from poor husbandry or something else within the test environment, you could also say the same happened to at least a significant percentage of the carp that died in that.

Senator COLBECK: I wasn't trying to attribute any cause to it; I was just trying to find out. I think you're skipping a bit ahead of the questions at this point and trying to make an attribution when I wasn't looking for one. I just asked the question, and I think Mr Falconer has got me close to where I wanted to be—that it wasn't determined. My next question was going to be: given that we're going through an investigative process to determine whether or not we do this, why would it be discounted? Give me a scientific reason—I'm not interested in an opinion; I'm interested in a scientific reason—for it to be discounted. If it was determined that it wasn't the virus, why would you not determine what it was? If you've done a test to say it's not the virus—that's what you're testing, to see if it works—why would you not determine what did it?

Mr Falconer: If it was my study, I would look to do that, but it wasn't my study. By the criteria they'd set for infection, they didn't believe that the deaths could have occurred by infection. You would have to ask the authors why they didn't investigate that further.

Senator COLBECK: The test found that the fish weren't infected?

Mr Falconer: By the criteria they set.

Senator COLBECK: By the virus?

Mr Falconer: Yes.

Senator COLBECK: What does that mean? What does 'by the criteria they set' mean? Either they're infected or they're not.

Mr Falconer: This is not so much my area, but infection can be defined in a number of ways and it can be tested for in a number of ways. It's not universal.

CHAIR: I need to move on to Senator Patrick. An analogy would be with our white spot program, where at one level of testing they declared there was no virus, and then, by varying the sensitivity of some aspects of what they'd done, they declared the virus was in the prawns. What I understand Mr Falconer to be saying is that, in terms of the test, confined to those parameters the result was negative, and we've seen that with white spot. But I think Mr Falconer's challenging the test—perhaps if it had been done a different way or if another explanation was found as to what the fatal thing was.

Mr Falconer: On that second one, I don't have enough expertise in that area to know if it was appropriate or not, but I can tell you that they did not establish the actual cause of death.

CHAIR: All right.

Senator PATRICK: If I heard you correctly in your opening statement, Mr Falconer, you said that you didn't think that the papers would be published prior to the public consultation; is that correct?

Mr Falconer: Faith, could you please take that?

Faith Coleman: I've been pushing quite hard to get data. I'm a scientist; I like data. I was assured that the distribution mapping would be available in March, ready for the EPBC Act referral and the draft plan in July and September respectively. Those time lines have changed slightly, but that's roughly it. The distribution mapping—simply, where is there carp?—now won't be released until probably December, yet the time lines that I'm currently being given on the EPBC Act referral and the draft plan have not changed significantly.

Senator PATRICK: The advice we have is that the draft plan, based on a range of science, would be released in July this year.

Faith Coleman: Yes.

Senator PATRICK: And then there would be public consultation, so you would get to comment on the draft plan.

Faith Coleman: Without the reports that actually justify it.

Senator PATRICK: Is there a suggestion that the draft plan has been withheld deliberately in any way, or is it simply that it's not going to be ready?

Faith Coleman: I don't know that it's deliberate. I think they're trying to stick to a time line. It's just not good practice. A plan is about what you're going to do. If you live in the catchment, like I do, if you live in the Coorong, you want to actually see a map saying, 'This is where the carp are,' for instance—just because it's a really simple point of the research—before I as the public approve such a plan.

Senator COLBECK: [inaudible] the research. They can be on one side of the lake at one time of the year and on another side of the lake at another, and it can change with the time of day and the weather conditions.

Faith Coleman: Absolutely, but the NCCP is mapping them. It's more about where they are roughly within the system. At the moment it looks like most of the carp are in South Australia, God bless them. But there are a lot of other things. That is one aspect. All of the research at the moment looks like it's delayed. It was going to be released to the public to read before the draft plan came out. Now it looks like it's going to be released after peer review in December.

Senator PATRICK: I understand where you're coming from. In fact, I like the idea—and it goes to the concern before about playing the ball and not the man—that the data is released and everyone gets to discuss the data. I was trying to work out whether or not it was some sort of deliberate withholding of data. Maybe that's a question we can ask on notice—the status of these various reports that are being prepared and the timetable for release in relation to the public consultation.

Faith Coleman: I'm pretty certain it's not deliberate; I'm pretty certain the science is just taking longer.

Senator PATRICK: Well then do you say that we should wait in order to be able to—

Faith Coleman: We need to delay the release of the plan. They're out of step. We need to delay the release of the plan until such a point as we have the data.

Senator PATRICK: I presume the CSIRO model that looks at how you might approach the release of the virus would also be dependent upon knowledge of the location of the carp. One presumes that the model requires that as input.

Faith Coleman: One would assume so, yes.

Mr Falconer: And there's one particularly critical element. Distribution mapping is not just about where the carp are located; part of this project is also determining just how much carp biomass there is in our system. If it's one million tonnes, that's one thing. The most recent estimates are of up to six million tonnes.

Senator PATRICK: There is like a quantum error here if you were to advance a plan without that knowledge. It makes it somewhat irrelevant to comment on the plan because inputs to the plan are so variable that it just doesn't make sense.

Faith Coleman: It would make a difference between the densities not being high enough for the virus to supposedly work and having every drop of water as primary untreated sewage to having an absolute monstrosity there. We're dealing with a huge difference in densities. The original estimate by Barnaby was two million tonnes, and that has sort of sat there, but I've heard lower estimates of 500,000 tonnes. Now this six million tonnes seems to be going around. The density mapping has taken so long. Knowing the method that they used, possibly one of the delays is because they're not getting as many recaptured, which means that there is a higher population than they budgeted for.

Senator PATRICK: So you say that your comments on the plan would vary significantly depending on that piece of information?

Faith Coleman: Completely.

CHAIR: Indeed, the plan itself could not be settled as an effective plan to respond to this until you know the scale, if you like, of the challenge.

Faith Coleman: Absolutely. What I heard when I myself asked that is that the NCCP team have seen preliminary data and they're basing the planning on that. If the preliminary data is good enough for them to base a plan on then it is surely good enough for members of the rest of the scientific community to also review.

Senator PATRICK: And there would be no problem in a normal scientific environment to release preliminary data and state the caveats around it?

Faith Coleman: Absolutely. That's standard practice.

Senator PATRICK: I'm mindful of the time. I want to move to the model CSIRO are developing. Is there transparency around that model in terms of understanding what the inputs are? There is a second question I'd also like to ask about that. Is the modelling a closed loop in the context of it being based on other modelling? You'd understand the process: you develop a model, you then verify the model and each time you have an experience it makes the model much more accurate. Perhaps my question goes better to the maturity of that. Are we talking about a brand-new model or are we talking about a model that in fact is based on experience in other jurisdictions? Do you have any knowledge of that?

Faith Coleman: I have asked for details of the model and have yet to obtain them. Jonathan may know better than I, but I have no details as to how the model is being determined.

Senator PATRICK: That might be something we ask, Chair.

CHAIR: I don't think we underestimated the time we'd need; I think today was an exploration and I think it's promoted us to think about how we might manage some time in the future to continue. So for the moment I want to thank you all for the effort. I don't know whether you have travelled—are you travellers?

Faith Coleman: Yes.

CHAIR: I want to thank you for your effort and I am fairly confident we will be together again. Let me check again where you are from?

Mr Rocliffe: The Central Coast of New South Wales.

Mr Falconer: Western Australia—Perth.

Faith Coleman: The Coorong in South Australia.

CHAIR: Well, that's a big effort to present here today. We will need to look at how we manage our time with you again and see if we can't help meet you somewhere for that to happen. I appreciate your time. Please take care on your return to your port of choice, and we'll look forward to seeing you again in the future.

Faith Coleman: Thank you.

Mr Rocliffe: Thank you very much.

Committee adjourned at 18:31