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# Standing Committee on Fisheries and Oceans

EVIDENCE

**NUMBER 021**

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Chair: Mr. Ken McDonald





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• (1145)

[English]

**The Chair (Mr. Ken McDonald (Avalon, Lib.)):** I call this meeting to order.

Welcome to meeting number 21 of the House of Commons Standing Committee on Fisheries and Oceans.

Pursuant to Standing Order 108(2) and the motion adopted on February 1, 2022, the committee is resuming its study of science at the Department of Fisheries and Oceans.

For those participating by video conference, when you are ready to speak, click on the icon to activate your mike, and please speak slowly and clearly. When you are not speaking, your mike should be on mute. For interpretation, you have the choice, at the bottom of your screen, of either the floor, English or French. I'll remind everyone that all comments should be addressed through the chair.

Before I go to witnesses, I would like to welcome the member from Saanich—Gulf Islands, a person whom I've come to know as a friend.

Ms. May, welcome to the committee again.

I would now like to welcome our witnesses here today and apologize for the delay. There was a vote call and, of course, that takes precedent over any other work that's taking place here on the Hill. As well, I will let everybody know that we can go to 1:30, hard stop. We can't go any longer, but we will get that much of a bit of extra time.

I would now like to welcome our witnesses today. Appearing as an individual and in person, we have Mr. Greig Oldford, Ph.D. candidate and scientist, University of British Columbia. Also, virtually, we have a number of witnesses: Dr. Gideon Mordecai, research associate, Institute for the Oceans and Fisheries, University of British Columbia; Dr. Dominique Robert, professor and Canada research chair in fisheries ecology, Université du Québec à Rimouski; from the Committee on the Status of Endangered Wildlife in Canada, Dr. John Reynolds, chair; from Ecometric Research Inc., Dr. Josh Korman, fisheries scientist; and, from Ocean Networks Canada, Dr. Kathryn Moran, president and chief executive officer.

I will now go to Mr. Oldford, please, for his opening statement of five minutes or less.

**Mr. Greig Oldford (PhD Candidate and Scientist, University of British Columbia, As an Individual):** Thank you, Mr. Chair.

Thank you to the committee for the opportunity to be here today. As I understand it, my function here is to provide testimony as an ecosystem scientist. I have expertise in integrative ecology and computer simulation modelling with a focus on Canada's west coast.

DFO has an ecosystem science framework. In it, ecosystem science is defined as a broad approach to studying relationships and interactions in the ecosystem, and it integrates science outputs. We prioritize and try to understand the key relationships in nature and their links to human needs and management actions.

Since 2018 I've had the privilege of conducting Ph.D. research at the University of British Columbia's Institute for the Oceans and Fisheries. This research is funded in part by DFO. I'm an indentured public servant on education leave. Given my absence from DFO for a prolonged period, please note that I'm not privy to current departmental processes and procedures. I'm appearing today as an individual, not as a DFO spokesperson.

My research is motivated by a mystery—that is, the declines and chronically low rates of marine survival of Pacific salmon in the Salish Sea since the 1970s. Specifically, I've been investigating the possible causes of low marine survival in juvenile coho and chinook salmon. I've developed oceanographic and ecosystem simulation models with the aim of integrating and evaluating a suite of scientific hypotheses. These hypotheses were put forth by the Salish Sea Marine Survival Project, a five-year interdisciplinary initiative.

Interdisciplinary work and collaborations between institutions are essential for ecosystem science. The work thus far was made possible through resources and expertise from the global ocean modelling lab led by Professor Villy Christensen, from international collaborators, and from DFO scientists. Support has been provided by the Pacific Salmon Foundation, DFO, UBC, the Natural Sciences and Engineering Research Council, Ecopath International and by access to Compute Canada's high-performance computing infrastructure.

The work of integrating data and science to investigate the declines in marine survival has been a daunting challenge. As you've heard, certain key hypotheses have emerged. They include increased predator abundances; viruses and pathogens; declines in prey abundance or prey nutritional value; industrial pollutants and contaminants; habitat loss; and various effects related to climate regime shifts and climate change. These are all summarized in a report that was produced last year by scientists leading the Salish Sea Marine Survival Project.

My Ph.D. research is ongoing, and it's not yet through peer review, but I'll do my best to answer questions.

Mr. Chair, with my remaining minute, I should like to emphasize the importance from an ecosystem science perspective of "scoping" science—essentially, the process of arriving at carefully crafted questions. I'd like to quote from a popular text on adaptive management of natural resources:

...the most difficult step is where it's decided on what basic components are to be considered. Perhaps the most important lesson is the value of deliberately looking at the system more broadly and in somewhat more detail than initially appears worthwhile.

Making progress in the field of ecosystem science requires "encompassing intellectual approaches across a spectrum ranging from reductionist to holistic." It therefore would be supportive of an ecosystem approach to management to "cast a wide net" to include indigenous knowledge, fisher knowledge, local knowledge, citizen science and other valued sources as early in the process as possible. Notably, this is aligned with the SAGE principle of inclusiveness.

To wrap up, casting a wide net is not incompatible with modern ecosystem science and ecological modelling. In fact, it's necessary if we're to make a dent in understanding how these complex socio-ecological systems work.

Thank you very much.

• (1150)

**The Chair:** Thank you, Mr. Oldford.

We'll now go to Dr. Gideon Mordecai for five minutes or less, please.

**Dr. Gideon Mordecai (Research Associate, Institute for the Oceans and Fisheries, University of British Columbia, As an Individual):** Thank you, Mr. Chair and members of the committee, for inviting me to speak today.

I am a viral ecologist and geneticist at the University of British Columbia. I work alongside a team of scientists from the Pacific Salmon Foundation and DFO. Much of my research is focused on a virus called piscine orthoreovirus, abbreviated as PRV.

I would like to talk to you about PRV, because I think it highlights some of the issues that have been raised to the committee regarding science advice. On paper, DFO sets a very high standard for scientific integrity. However, I have witnessed striking examples of where DFO has failed to meet these standards in regard to the management of PRV.

The story begins in Norway in the late 1990s. There were outbreaks of a new heart disease in Atlantic salmon farms, but it wasn't until over 10 years later that the virus, PRV, was discovered and im-

plicated as the possible cause of disease. Thanks to some of the impressive research within DFO, it didn't take long for scientists to realize that this virus was also present in British Columbia.

In 2011 PRV was detected by Dr. Kristi Miller's lab in farmed Chinook salmon that were suffering from disease. Her work was the first sign that PRV might pose a risk to Pacific salmon.

As recently reported in the Globe and Mail, the public were kept in the dark about this research for 10 years. Had this work not been held back from the scientific community, perhaps some of the impact on salmon in B.C. from this virus may have been prevented.

Since its discovery, PRV has been linked to diseases in salmon all around the world, including diseases similar to that described in the blocked study.

**The Chair:** Dr. Mordecai, could you lower your mike just a little? The interpreters are not hearing you.

Perfect. Please continue.

**Dr. Gideon Mordecai:** There is now overwhelming evidence that PRV poses a risk to wild Pacific salmon, and salmon farming is amplifying those risks. I will review this body of work in my written submission to you, but the take-home message is that salmon farms are a source of infection to wild salmon, and infections are linked to disease, poor health and poor survival.

Despite all this evidence, most of which was gathered by DFO scientists themselves, DFO have largely proceeded as if these findings did not exist, and conclude that farms pose minimal risk. As a consequence, salmon have not received the protection they need.

While Dr. Miller's study was being hidden, DFO managers actively supported other scientists to work with the salmon farming industry to undermine her findings, making claims that PRV does not cause disease. My scientific evaluation is that none of this work rules out the possibility or negates existing evidence that PRV can, and does, cause disease in salmon.

PRV sent from B.C. to Norway has been shown to cause the same patterns of disease that occur on farms in B.C., but DFO continues to ignore this result since the study was conducted in Norway. For some reason, DFO requires disease relationships to be proven within Canada.

Can you imagine if we used similar thresholds in human medicine? The COVID virus would not be classified as a disease agent in Canada, since the only human challenge trial was conducted in the U.K.

DFO's CSAS review found that PRV cannot be the cause of disease because it can be found in healthy fish and without high mortality on farms. This is just like saying that COVID does not cause disease because some infected individuals are asymptomatic. Making such fundamental errors in reasoning makes me very concerned that DFO is not providing evidence-based science in line with their scientific integrity principles.

DFO's science relies on the selection of industry-funded lab studies, which place a high bar in their definition of what constitutes "disease". Meanwhile, research that does find evidence of harm is ignored or suppressed. This raises questions of whether conflict of interest could have influenced how CSAS reviews were designed, interpreted and reported.

One of Canada's top fishery scientists, Jeffrey Hutchings, posed this question: "Are we interested in preventing disease, or the semantics of whether mortality events meet the right definitions?" This simple question is a powerful statement on how DFO has mismanaged this issue using restrictive definitions and cherry-picking data to fit a narrative. DFO has repeatedly lost in court, because their management of pathogens on farms is deemed unlawful and their decision-making lacks transparency.

The response from DFO officials will be that the CSAS process meets peer review standards. You have heard from previous witnesses some of the problems of the CSAS process. For instance, the panel can be dominated by participants with close ties to the industry. Normally in science, reviewers who have a conflict of interest are often excluded, especially if the conflict is financial. Would you ask a tobacco company to review the science risks concerning lung cancer?

The examples that this committee has heard illustrate how science advice from DFO is not always accurate, reliable, up to date or free from political and commercial interference. The assessment and summary of scientific information to decision-makers need to be free from vested interests. My recommendation is for an independent fisheries science body that would be able to review and weigh evidence, especially in light of conflicts of interest.

Thank you very much for the opportunity to present today.

• (1155)

**The Chair:** Thank you.

We'll now go to Dr. Robert for five minutes or less, please.

[*Translation*]

**Dr. Dominique Robert (Professor and Canada Research Chair in Fisheries Ecology, Institut des sciences de la mer, Université du Québec à Rimouski, As an Individual):** Thank you very much, Mr. Chair.

I will briefly introduce myself. I am a professor and research chair in fisheries ecology at the Université du Québec à Rimouski. As part of my research program, I regularly work with researchers from the Department of Fisheries and Oceans, DFO, in the regions of Quebec, Newfoundland and Labrador, the Maritimes and the Gulf. I have also participated in the work of the Canadian Science Advisory Secretariat, or CSAS, in all of these regions. I participated in these processes as a university researcher, and sometimes as

an external reviewer. So I consider myself to have good experience with these types of processes in eastern Canada for various fish stocks.

First of all, I would like to commend the quality of the work of DFO researchers, who I believe are highly qualified to carry out the scientific work in their mandate. When conducting stock assessments, data are rigorously presented and conclusions are reached by consensus. They are generally based on available scientific data. However, the quality of available data varies greatly between stocks. The assessment of some historically and culturally important species, such as Atlantic cod in eastern Canada, relies on high quality data from multiple sources. Other stocks, however, such as forage species, are data poor. Basic measures, such as their spawning biomass, are sometimes unknown. The quality of the recommendations that scientists can make is therefore directly dependent on the data available.

A limitation to collecting sufficient data on some stocks is the ability of DFO to undertake new surveys. Despite the recent arrival of new coastal vessels and trawlers, the Canadian Coast Guard fleet, on which DFO relies for its monitoring activities, is aging and overused. It is clearly insufficient to consider adding major new surveys. This problem is particularly acute in the Arctic regions, where increased fishing activity is expected in the coming years due to global warming. I believe that DFO needs modern research platforms to better fulfill its resource assessment mandate.

The rapid ecosystem changes we are currently experiencing because of global warming also require the consideration of ecosystem variables in stock assessments to ensure sustainable management of our resources. The ecosystem approach to fisheries management is a major component of the new Fisheries Act, passed in 2019. That same year, the Canadian Science Advisory Secretariat published a DFO research paper. This report, written in 2019 by Pierre Pepin and his associates, presented the state of affairs on including ecosystem variables in stock assessments.

The report concluded that, out of 178 stock assessments, less than half considered ecosystem aspects, even in a qualitative way. Given the scale of the effects of climate change, it seems crucial to consider the recommendations of this report in the short term. Three years after publication, however, it is hard for me to know what kind of plan DFO has put in place based on the elements of the report. I recommend accelerating the implementation of an ecosystem approach to fisheries management in Canada.

One of the interesting aspects of this report is the need to better consider the social and economic impacts of climate change. To be more flexible and effective, management approaches should integrate the economic and social context of fisheries, both explicitly and scientifically, as well as information on stock dynamics. This capacity does not currently exist within the department. I therefore recommend that, upstream of management decisions, economists and sociologists be involved in the scientific process.

Finally, as several witnesses have already mentioned during this study, I support and recommend the establishment of a decision-making structure that would include a ministerial obligation to make decisions based on the findings of scientific stock assessment processes, with no room for discretionary intervention.

• (1200)

Thank you, Mr. Chair.

[*English*]

**The Chair:** Thank you.

We'll now go to Dr. Reynolds, for five minutes or less, please.

**Dr. John Reynolds (Chair, Committee on the Status of Endangered Wildlife in Canada):** Thank you, Mr. Chair, for inviting me to participate with the standing committee.

I'm going to start by wearing my hat as a professor at Simon Fraser University, not on behalf of COSEWIC, and with that responsibility I'll briefly remind the committee of some of the difficulties that DFO has had with translating scientific advice into management advice. Then I'll describe an alternative model for the way this might be done more appropriately based on my experiences with COSEWIC, the Committee on the Status of Endangered Wildlife in Canada.

Long before I became chair of COSEWIC, I saw a long history of difficulties that DFO management had in dealing with research by my own team at Simon Fraser University and by other academics showing that wild salmon populations are harmed by sea lice emanating from salmon farms on the west coast of Canada. Dr. Bateman from the Pacific Salmon Foundation described some of those issues to this committee last week and you just heard from Dr. Mordecai about similar issues with the effects of viruses.

Until recently there has been a consistent pattern of denial of the harm caused to wild salmon by salmon farming, which suggests to me, as a salmon biologist, that policy preferences have been affecting science advice rather than the other way around.

The other example that I'll very briefly mention involving DFO's struggle to generate independent science advice comes from the case of endangered steelhead trout in British Columbia. Again, the committee has heard already from others about that. I won't go into detail, but the key issue is that although DFO convened a panel of federal and provincial scientists and industry stakeholders to review the fish's status and potential for recovery, the advice to the minister that came from this review reduced the emphasis on the role of by-catch salmon fisheries as an ongoing threat to the steelhead—and bycatch management, I'll remind you, is DFO's responsibility. This is another example where there's been an issue when it comes to the

translation of peer-reviewed science advice into management advice.

Mr. Chair, I mention these two examples, as I said, from my vantage point as a professor at Simon Fraser University. I had no idea that I would eventually become the chair of COSEWIC, where I learned about a model for greater independence and transparency.

Members of the Committee on the Status of Endangered Wildlife in Canada are appointed by the Minister of Environment and we are explicitly directed to provide independent advice. That independence is enshrined in the Species at Risk Act and it is reiterated in the ministerial appointment letters that we receive. Many of the members, including me, are volunteers. Others contribute as part of their day jobs as endangered species experts employed by provinces, territories and federal agencies.

Our status reports undergo three rounds of extensive independent peer review, and our meetings where we decide on the status of threatened species are open to observers. The results of our work are used not only by the federal government for decisions about protection and recovery under the Species at Risk Act but also by a much wider audience of people who have a shared interest in conservation. For example, in June 2021, when DFO announced the creation of a \$647 million Pacific salmon strategy, COSEWIC's determinations on the status of salmon were mentioned explicitly.

The good news is that as chair of COSEWIC, I am very pleased to report that our collaborations with DFO's scientists on status reports of aquatic species have been very positive. We have two DFO scientists appointed to our committee and we work closely with them and many others on aquatic species. The interactions with DFO at the science level have always been very positive, and I'm grateful for the help and expertise that DFO brings to our shared enterprise, but the key to our success is that we all follow a hard directive to provide unbiased, independent science advice where we ignore our day jobs or any potential desired outcomes that others may have.

Mr. Chair, I suggest that a similar directive could run from DFO science through to management. Specifically, DFO could adopt a prime directive where management objectives are expressly prohibited from influencing science, and there could be checks and balances along the way to ensure that is occurring. Science management should also be fully transparent with all documents involved in decision-making publicly available and subject to peer review from outside of DFO.

I believe that if these principles of world-class science were also applied to transparent decisions for management, this would lead to improved outcomes for the conservation of aquatic biodiversity and sustainable fisheries and aquaculture.

Thank you.

• (1205)

**The Chair:** Thank you for that.

We'll go to Dr. Korman for five minutes or less, please.

**Dr. Josh Korman (Fisheries Scientist, Ecometric Research Inc.):** Thank you, Mr. Chair, for the opportunity to be a witness today.

I'd like to begin by providing a brief summary of my background.

I'm a fishery scientist who runs a small consulting company in Vancouver and I'm an adjunct professor at the University of B.C. My work focuses on the effects of dams and harvesting on the population dynamics of salmon, steelhead and trout. I've been an author on seven papers that have gone through the CSAS or PSARC review process. I have also acted a reviewer on a number of occasions.

I believe the main reason I was asked to appear before this committee is that I'm the senior author of the emergency recovery potential assessment for interior Fraser River steelhead that was reviewed under CSAS in 2018, which Dr. Reynolds just mentioned.

From my experience with CSAS, the review process of working papers is actually quite rigorous. I have not observed that unsupported bias from DFO fisheries management or outside parties have unduly influenced CSAS working papers or their final versions.

However, I have observed substantive meddling by DFO in the conversion of a recovery potential assessment report for interior Fraser steelhead into the scientific advice report or SAR. A SAR is intended to summarize the key findings of CSAS papers and serves as a central document that provides management advice.

There were two main conclusions from our final recovery report relevant to management advice. First, reductions in the abundance of seals and sea lions was deemed to be the most effective way of recovering steelhead populations. This fundamental conclusion was substantially altered by DFO when they wrote the SAR. For example, they stated there was no consensus that there was a causal relationship between the two—meaning a relation between steelhead and seals and sea lions.

This directly contradicts our final report, where multiple lines of evidence for the relationship between steelhead and seals and sea lions was presented.

[*Translation*]

**Mrs. Caroline Desbiens (Beauport—Côte-de-Beaupré—Île d'Orléans—Charlevoix, BQ):** Mr. Chair, we're not hearing the interpretation.

[*English*]

**The Chair:** Hold on one second, Dr. Korman.

Madame Desbiens.

[*Translation*]

**Mrs. Caroline Desbiens:** I can't hear the interpretation.

I'm sorry.

[*English*]

**The Chair:** I'm not getting....

[*Translation*]

**Mrs. Caroline Desbiens:** All right.

Maybe the speech rate was too fast for the interpreter.

[*English*]

**The Chair:** Dr. Korman, we're having trouble interpreting for some of our participants here today. The interpreters are asking if you could slow down a little bit and maybe move your mike down slightly.

Usually people are telling to me slow down, but today, I have to tell you to do it for the interpreters.

Please continue.

**Dr. Josh Korman:** I'm sorry about that. I'll talk a bit slower.

I don't recall hearing any substantiated objections to our conclusions during the CSAS proceedings, but I can't document this discrepancy because the proceedings are still not available.

Second, the recovery potential report showed that the predicted trajectories of steelhead populations were relatively insensitive to reductions in steelhead bycatch in salmon fisheries. This occurred because the current harvest rates on steelhead are estimated to be relatively low, at approximately—

• (1210)

[*Translation*]

**Mrs. Caroline Desbiens:** Mr. Chair, I am sorry.

I am raising a point of order again, because we still don't hear the interpretation.

[*English*]

**The Chair:** We'll check with interpretation for a moment before we start again.

[*Translation*]

**Mrs. Caroline Desbiens:** Maybe we should just give our interpreters a little time so that they can catch up.

Thank you.

[*English*]

**The Chair:** We're going to try this again.

Mr. Small, I don't think you have the floor, so I'd appreciate some silence, please.

[Translation]

**Mrs. Caroline Desbiens:** I would like to take this opportunity, Mr. Chair, to thank the interpreters, who do an exceptional job. It is not always easy to follow the conversations and it requires speed. I thank them once again.

[English]

**The Chair:** That's duly noted.

Dr. Korman, if you could start somewhere a little bit back from where we ended, it would be much appreciated.

**Dr. Josh Korman:** Sure.

Second, the recovery potential report showed that predicted trajectories of steelhead populations were relatively insensitive to reductions in steelhead bycatch in salmon fisheries. This occurred because the current harvest rates on steelhead are estimated to be relatively low, at approximately 15% to 20%.

However, given the unequivocal and severe conservation concern for interior Fraser steelhead, an immediate reduction in bycatch mortality is a logical potential action that the minister could take. In writing the SAR, some at DFO tried to head off this potential outcome by stating, "Allowable harm should not be permitted to exceed current levels". We never said this in the final recovery potential document. We said, "and exploitation be reduced below current levels of exploitation whenever possible".

It is worth noting that the recommendation to maintain status quo bycatch of steelhead in the SAR is inconsistent with what DFO has done to protect weak salmon populations. For example, DFO responded to the 1998 coho crisis by imposing very substantive fisheries closures. Substantive closures to protect Cultus Lake sockeye and more recently Fraser River chinook have also been implemented. DFO decisions thus appear risk averse for protecting weak salmon populations, but not so for protecting weak steelhead ones.

In summary, the main conclusions from the SAR for interior Fraser steelhead are not consistent with the main findings of the final recovery potential report. The SAR de-emphasized the importance of seal and sea lion predation and promoted the idea that status quo salmon fishing is okay. In my view, the first modification on effects of seals and sea lions is the most problematic because it misrepresents the primary tool available to us to improve the status of interior Fraser steelhead and likely for chinook and other salmon.

In closing, I empathize with the challenges that DFO and the minister face when making very difficult trade-off decisions for conservation of weak populations versus salmon fishing. Given this trade-off, it is hard to understand why DFO appears so reluctant to consider control of seal and sea lion populations on the south coast of B.C. I believe we need a more transparent process where the rationale for conservation and fishing decisions made by DFO can be evaluated by the public to determine if the decisions are consistent and also compatible with existing policies on harvesting and conservation.

Thanks for your attention and interest.

• (1215)

**The Chair:** Thank you, Dr. Korman, and thank you for your patience.

We'll now go to Dr. Moran for five minutes or less, please.

**Dr. Kathryn Moran (President and Chief Executive Officer, Ocean Networks Canada):** Thank you so much, Mr. Chair.

I will start by saying that even though the sign behind me says "Nova Scotia", and I love all of Canada's three coasts, I'm speaking to you from the territories of Lekwungen-speaking peoples here in Victoria, British Columbia.

As you have seen, I am president and CEO of Ocean Networks Canada, but my background is oceanography and ocean engineering, not biology or ecosystem science.

Ocean Networks Canada operates world-leading, cabled ocean observatories in Canada's Pacific, Atlantic and Arctic Oceans, and we collect and deliver real-time data for scientific research for societal benefits and industry.

Through our unique data management system, Oceans 3.0, data from our observatories are collected in all forms, quality assured and archived. We make all of our data open and freely available to Canadians and anyone in the world, which I would be happy to elaborate further during question period, because it is my view that open data, data products and results are the core foundation for informing policy and management decisions.

In 16 years of operations, Ocean Networks Canada has supported 20,000-plus global users, including many DFO scientists. We currently host 9,000 sensors, many of which are Canadian made, and Oceans 3.0 has collected more than a petabyte of data, which is big data.

As a major science initiative with an operating budget in the order of \$27 million a year, we receive funding from the Canada Foundation for Innovation for 60% of those dollars through ISED and 40% from the delivery of essential national data products and services that align and help the federal government achieve departmental mandates, including DFO's mandate under the oceans protection plan and for ocean protection in the soon-to-be-expanded marine protected areas.



For example, Ocean Networks Canada operates high-frequency coastal radar and underwater microphones called hydrophones. These high-frequency radars are on land and look out over vast areas of the surface ocean in areas such as the Port of Vancouver, Port of Prince Rupert and Halifax where real-time, surface current data are provided for users that help to make the marine system safe.

The hydrophones are sensors that listen to underwater noise and are essential for reducing noise and for understanding species at risk and their habitats, including here on the west coast the southern resident killer whales.

Another example is Ocean Networks Canada's long-time series data, a particularly important scientific contribution for DFO. For 16 years we have captured and provided essential ocean variables that help provide scientific evidence to ocean changes and anomalies caused by climate change. This includes areas such as Canada's first marine protected area, the Endeavour Ridge, and much of DFO's current Pacific area of interest.

Ocean Networks Canada also provides data support during DFO scientific expeditions, marine protected area expeditions and indigenous community outreach and engagement. One of Ocean Networks Canada's most successful programs supported by DFO is our community fishers program. These are partnerships with communities, mostly indigenous, who collect data from their own vessels of opportunity. We will be expanding this program even further across Canada's coasts over the next four years through DFO support to empower our indigenous communities to collect their own data and to do that on behalf of Canada as stewards of our coasts.

The ocean crosses many departments. With the creation of the oceans protection plan, it was perhaps the first time that Canada developed a multi-departmental ocean approach to deliver this five-year program. Today, however, there's a heightened need for cross-department collaboration in the Arctic Ocean and on the rest of Canada's coasts, but in the Arctic Ocean specifically because it is home to the longest part of our coastline, which is the longest in the world. With the extreme climate-induced changes that are occurring in the ocean, Arctic security and sovereignty must be a top priority for DFO and other federal departments.

I have some experience in this area. Before I came to B.C., I was working in the White House Office of Science and Technology Policy under the Obama administration, where I served as associate director focusing on many areas, including the Arctic and climate policy issues.

During this time, I helped develop the first U.S. national ocean policy across multiple agencies—more than 25 departments and entities. I think it is past time for Canada to take this approach to marshal and leverage assets across the federal family and in partnership with ocean infrastructure operators like Ocean Networks Canada and others along other coasts.

• (1220)

I'll close by saying that I'd be happy to talk more about our strength in data, and how data and open data can help achieve very rich and robust management decisions for the ocean.

Thank you very much.

**The Chair:** Thank you, Dr. Moran.

That concludes the statements by witnesses.

We'll now go to rounds of questioning by members. I will ask members to please identify who you're directing your questions to in order to make best use of your time. We have six witnesses today, and there's nothing worse than having everybody stare at the screen or at one another.

We'll start off with Mr. Arnold for six minutes or less.

I will note that Dr. Reynolds has a hard stop at one o'clock our time, so if you have questions for Dr. Reynolds, you might want to get them in before that time slot.

We have Mr. Arnold, please, for six minutes or less.

**Mr. Mel Arnold (North Okanagan—Shuswap, CPC):** Thank you, Mr. Chair.

I'd like to thank all six witnesses for participating in this important study.

I'll start off with a question for Mr. Mordecai and Mr. Korman.

Based on your experiences in working around fishery science in the Pacific region, what have your observations been in terms of how DFO plans, resources and handles science meant to support the decisions of the department and the minister?

Perhaps Mr. Mordecai can go first.

**Dr. Gideon Mordecai:** Thank you for the question.

I covered much of my points in my statement. I guess I focus on instances where we've heard of science coming from DFO scientists themselves, whether that's through a CSAS process or through internal communication of science, and science not making its way to the management decisions.

We've heard different examples of how at various stages there can be a block to information. I think that's where the committee needs to focus: on making sure the science information can get to the decision-makers without that block.

I'll leave time for Dr. Korman.

**Mr. Mel Arnold:** Thank you.

Go ahead, Mr. Korman.

**Dr. Josh Korman:** My experiences with stock assessment, counting salmon and harvests and determining harvest rates, are principally the work I've done with DFO. The challenge is that there are a heck of a lot of salmon streams and inadequate funding to monitor them. That has varied over the administrations with regard to the amount of funding DFO has received.

There are cases where they've been explicitly directed to collect better data, such as in the interior Fraser coho crisis. Twenty years later, when we go to look at the new data, we realize that the better stock assessment was not done. I'm not close enough to the department to know how much of that has to do with funding and how much has to do with problems within the department. I suspect some mix is possible.

I think a common theme is sort of that promises are made to do better science and, in looking at that in the fullness of time, you see that often that doesn't work out.

**Mr. Mel Arnold:** Thank you, Mr. Korman.

Can you provide any suggestions for or recommendations on the process of determining what science should be undertaken and how that eventual information and data are relayed up to the decision-making process in the department or the minister's office? How can the system be improved?

**Dr. Josh Korman:** You know, I really—

**Mr. Mel Arnold:** I guess we heard from Dr. Reynolds about a more independent process. Do you have any thoughts on that yourself?

• (1225)

**Dr. Josh Korman:** Yes, with regard to making the decisions from science and translating that into management, I agree with the sentiments of a number of the panellists today. We need some sort of firewall or independence to confirm that what the science says is translated into the management advice.

For one thing, in our case, it could have been done by letting the authors of our steelhead report take the first crack at the management advice. We were excluded from writing that document.

There are some obvious things that can be done to better strengthen the linkage between the management advice and the science.

**Mr. Mel Arnold:** Thank you.

Again, this is for you, Mr. Korman. You provided evidence to the Cohen commission that showed that the short data record at the time meant that there was a very low statistical power of the data being able to show potential relationships between salmon farm variables and measures of sockeye health and productivity. Is that correct?

**Dr. Josh Korman:** Yes.

**Mr. Mel Arnold:** Cohen also accepted your evidence, and that of Dr. Dill, that scientists needed another 10 years of regulatory data, until at least mid-2020, before they could more confidently identify if there were any relationships that might exist.

Would that be correct?

**Dr. Josh Korman:** Yes.

**Mr. Mel Arnold:** Thank you.

In your opinion, has the data record been established since the Cohen commission that can confidently identify impacts of B.C. salmon farms on wild salmon?

**Dr. Josh Korman:** Well, there's been substantive research since that time, and you've heard some of it in Dr. Miller-Saunders' testimony, and others. I think progress has been made.

The challenge is that the questions they're trying to answer are very difficult, so throwing more money at it, and even cutting-edge research, is going to make it very difficult to ultimately establish how disease transfers from farms to wild fish, and how that translates into survival and, ultimately, returns of salmon. It's a very tough question.

I think some progress has been made, but clearly not enough to make some strong science-based decisions on the farms. There's a lot of uncertainty about their impacts at this point. I believe that uncertainty is going to remain for quite a while due to the challenge of the questions they face, in spite of the good research that's being done.

**Mr. Mel Arnold:** Okay. Thank you.

In your opinion, then, a decade after the Cohen report, where is DFO at in completing the study of the interactions between salmon farms and wild salmon?

**Dr. Josh Korman:** I would pass that to Dr. Mordecai, or others who have been closer to that.

They have certainly made some progress.

Of course, you've heard the controversy about whether these eight or nine SARS on salmon farm risk were accurate or not. There's quite a bit of debate. I haven't been close enough to know, but I certainly look at research by Dr. Miller-Saunders, Dr. Mordecai and others, and there's certainly good work being done. Progress is being made. I just think it's a hard question to answer.

**Mr. Mel Arnold:** Thank you.

I think my time is up.

**The Chair:** Thank you, Mr. Arnold. You've gone a little bit over. I'm trying to be as strict as I can today with such short time.

We'll now go to Mr. Hardie for six minutes or less, please.

**Mr. Ken Hardie (Fleetwood—Port Kells, Lib.):** Thank you, Mr. Chair.

We've heard fascinating testimony from everybody so far today.

We'll start with Dr. Mordecai. You noted in your article in the newspaper that the consensus model was the mechanism that was actually a barrier to Dr. Miller-Saunders' research ever seeing the light of day. She mentioned this as well.

That must have been put in place for a reason. Can you give us a sense as to why it might have been there and, more importantly, what an alternative to that model should look like?

**Dr. Gideon Mordecai:** I can't speak to the CSAS process. I wasn't there in person. As scientists, we're used to having conflicting datasets. This is not a novel problem. I think there are better ways of dealing with that. I'm not sure—

**Mr. Ken Hardie:** What do those better ways look like, sir?

**Dr. Gideon Mordecai:** In science, we have independent peer review, and if we have someone who's truly independent from the process, they'll be able to weigh up the different datasets and try to come to a conclusion, recognizing that uncertainty, and with some transparency of that uncertainty.

The problem with the CSAS process, I believe, was that because the panel was dominated by one type of person with links to the industry, the consensus didn't reflect the complexities in that data and the different findings. Within that consensus process, some of the important work that had been done and those conclusions found...those ideas were suppressed.

• (1230)

**Mr. Ken Hardie:** From what we've heard this morning, there's the scientific advisory report, the SAR, and then there's the consensus model in the development of the science.

I'll put words in your mouth; I can't ask the question any other way. Would it be your opinion, Dr. Mordecai, that those are two filters that actually prevent necessary information getting to the minister?

**Dr. Gideon Mordecai:** I focus on a mechanism to have transparency throughout these processes. The review process needs to be open and transparent. We can see what information is going in, and we can see what information is coming out and being fed to the decision-maker.

As scientists, if we know the information is getting to a decision-maker, but they base their decision on a variety of other factors, we at least know that the science is being considered. That's currently not the case, and I think that's the root of the problem. I'd say that focusing on transparency would go a long way in helping those issues.

**Mr. Ken Hardie:** Thank you.

I have a question for Dr. Reynolds.

In earlier studies, it was mentioned that you could take all of the scientists involved here, lay them end to end and they would never reach a conclusion.

That is a critical issue, because we need to know, from your standpoint, what kind of advice is possible to give to a minister. With all of the uncertainties and all of the unknowns, what would a minister actually hear from science? In the process of trying to make a decision, would it be "Here's the data," or would there be recommendations? What would that look like or what could it look like, given all of the factors that scientists have to deal with?

**Dr. John Reynolds:** In cases like this, I think there are two issues that can help with this.

The first is a precautionary principle can be adopted. If it looks like there could be a problem, then a precautionary principle would suggest that you should assume there may well be one. That doesn't mean you necessarily shut everything down. Perhaps the recommendation to the minister would not go that far if there is so much uncertainty that we have to invoke the precautionary principle. It's well known that we should not be using that as a reason for inaction.

The other way to deal with this, though, is to look at the weight of evidence. We do that in science all the time. You could try to shoot down an individual study and say that it's just a correlation, for example, but eventually, the number of studies that are all pointing in the same direction by independent researchers could become overwhelming. The advice to the minister could be, "There is uncertainty in a complex problem, but the weight of evidence points to this, and, therefore, here are the potential options."

**Mr. Ken Hardie:** I wonder how much of that would actually take place given that every time a minister makes a decision, there's going to be somebody who doesn't like the decision popping up and saying, "No, we have science that says that's all wrong; you shouldn't do that."

This leads to something that Mr. Arnold mentioned in his very first question, which I think is very critical. He talked about science supporting decisions. That seems to me to be backwards in a sense. Shouldn't it be decisions supported by science? The first way, science supporting decisions, is the Fraser Institute model of research. Sorry, but it is simply the wrong way to go at it.

Would you agree, Dr. Reynolds?

**Dr. John Reynolds:** Yes. I think science comes first and science can point toward the state of the problem, if you think of it as a problem. It can also be used to consider potential solutions.

For example, Dr. Korman mentioned that they wrote that report, which would have also modelled the effects of different potential management actions on benefiting the steelhead. You can model or advise on what the potential options are and what are mostly likely to be effective. The minister then can take that information about the options and what the science is that is supporting those options, and then bring in these other factors that they have to consider, the trade-offs and the people who will be harmed by the management actions, for example.

As long as that's done in a transparent and open way so that people can see where the science enters and what other factors were being considered, then that would certainly be a process that I think a lot of people could sign up to.

• (1235)

**The Chair:** Thank you, Mr. Hardie.

We'll now go to Madam Desbiens for six minutes or less, please.

[Translation]

**Mrs. Caroline Desbiens:** Thank you, Mr. Chair.

I thank all the witnesses, whose words are truly enlightening.

I'm going to turn to Mr. Robert.

You presented a section on other sciences, such as sociology or economics, which would allow DFO to make decisions and give directives more adapted to the social reality. I found that very interesting.

Could you tell me more about that? Does that mean that there are no sociologists or economists coming in to shed additional light on DFO decisions at the moment?

**Dr. Dominique Robert:** There are no sociologists or economists present during stock assessments. Models in other countries, for example, Ifremer in France, which is the equivalent of Fisheries and Oceans Canada, have economic and social scientists involved in the processes.

Of course, here we are looking at scientific information from the biological, fisheries and stock dynamics point of view, but when this information is transferred to management, there are no economic or social science experts. So all the decisions can hurt the communities very much because there is no filter. The socio-economic context is not adequately considered in the process.

**Mrs. Caroline Desbiens:** I fully agree with you.

I want to come back to the issue of herring and mackerel. At the moment we are hearing about all sorts of human tragedies on the ground. I think the Department of Fisheries and Oceans might benefit from considering not only the fish stocks, but also the human side of the fishery.

So that would be a priority recommendation for you, I understand.

The other recommendation would be for scientists to be better fitted out with basic equipment, i.e., better boats to navigate the Arctic and so on. You have also highlighted this element, which is of particular interest to me.

Could you explain further the gaps that exist at the moment?

**Dr. Dominique Robert:** We have talked a lot today about species such as salmon or Atlantic cod, which are species on which we have an enormous amount of data. There have been extensive research programs on these species, for a long time, because they are valuable and they are important culturally and economically.

In eastern Canada, forage species are a good example. There are many stocks whose abundance is not even known. To know the abundance of an offshore forage species, we must develop surveys with major means. We are talking, for example, about acoustic monitoring of fisheries. We need vessels to carry out this initiative.

Currently, the Coast Guard fleet is entirely used for existing surveys. It is being monopolized. It's hard to get vessels repaired when they break down, because they're always needed. So there's a real problem there. If we want to offer better scientific advice with an ecosystem approach to management, but there is a lack of certain crucial components of the ecosystem, such as forage species, it will be difficult to achieve this. As already mentioned, there is a risk of uncertainty. And the more uncertainty there is, the more likely we are to make management mistakes.

I recommend that we look at ways to increase the Department of Fisheries and Oceans' offshore capacity.

• (1240)

**Mrs. Caroline Desbiens:** There is a lot of talk about pinnipeds. According to your analysis of the situation, are these species the worst enemies of some fish, at the moment, or are there others that are even more formidable?

**Dr. Dominique Robert:** Of course, people who are familiar with the southern Gulf of St. Lawrence know that the grey seal population has increased considerably. It is really the main predator in the system right now. That is one of the main reasons why groundfish stocks and some pelagic fish stocks are not doing well.

However, we must not forget the fishing activities. We were talking about mackerel earlier. That's an example I'm familiar with, because I wrote my thesis on mackerel at a time when stocks weren't threatened. For at least a decade, Fisheries and Oceans Canada's stock assessment reports have been saying that fishing pressure on mackerel is too high. The latest reports even talk about overfishing, and it took a long time before the fishery was closed.

Earlier, we talked about the independent model that Dr. Reynolds described very well. We have to come up with a management system that is more representative of the current situation and stop pushing the problem forward. As a result, mackerel fishing was stopped suddenly this year, without warning. It was the right decision to make given the state of the stock, but I think mackerel fishing should have been suspended or severely restricted long before that.

[English]

**The Chair:** Thank you, Madame Desbiens.

We'll now go to Ms. Barron for six minutes or less, please.

**Ms. Lisa Marie Barron (Nanaimo—Ladysmith, NDP):** Thank you, Mr. Chair, and thank you to all of the witnesses for being here today, both in person and virtually.

I want to ask Dr. Mordecai my first question. It's been about a year and a half now, I believe, since the decision by the previous minister, Minister Jordan, to close the fish farms on the Discovery Islands.

I know there has been research conducted since that time, in particular your research article on "Aquaculture mediates global transmission of a viral pathogen to wild salmon", as well as a recent paper by Dr. Batemen.

Could you expand a little bit on the research you've done? I'm curious to get your thoughts as to whether the decisions being made currently are using the most up-to-date, available science.

**Dr. Gideon Mordecai:** I'd summarize the science and say that we know that pathogens like PRV and *Tenacibaculum* are very common on farms; we know they're being transmitted from farms to wild fish; and we're beginning to understand that in some cases—for example, with PRV it's very clear—that they're linked to disease.

In a more recent paper that ranked all of the different pathogens and tried to consider if these pathogens had an impact on coho survival or their bodily condition—so the healthiness of fish—of all the different pathogens we studied, the two that came out on top were *Tenacibaculum* and PRV, the two pathogens most closely associated with farms.

I think the science is becoming more and more clear that there is an impact, and we can start to investigate this impact on populations.

The second half of your question was about the science review process. My experience, since publishing the paper you mentioned on PRV, is that these findings are not being considered. I see no evidence that these are being used in the science. There haven't been any official science review processes, and there's not much transparency in what happens on the inside.

What I can tell you is that for a virus like PRV, with all of these links to disease that I've described, DFO still does not consider it as a disease agent. So they're making decisions—and sometimes internally—that go against the international consensus on pathogens such as PRV.

• (1245)

**Ms. Lisa Marie Barron:** Thank you, Dr. Mordecai.

Could you also expand a little bit on the concept of minimal risk. We know that we see many different threats that have a compound effect together.

I'm wondering if you agree with what I've just said and if you can expand a little bit on how the process of utilizing minimal risk perhaps impacts the ability to use research like yours in decision-making processes.

**Dr. Gideon Mordecai:** I'd like to point out that those risk assessments were only carried out for one species of salmon, and we expect there to be differences between the species. They were only carried out for one population, Fraser River sockeye. I was in a ministerial round table two days ago, where the minister herself expressed that she couldn't see how those risk assessments found minimal risk when they hadn't been considered all together.

So there are clearly issues with the way that risk assessment was carried out, but also with how it is being used and extrapolated across all of the different species of salmon and, as the minister rightly pointed out, how they're not being considered together and how the impacts might be cumulative.

I'll leave more time for questions, I think.

**Ms. Lisa Marie Barron:** Thank you very much.

Mr. Oldford, I'm wondering if you have any thoughts around the use of minimal risk and how it impacts our decision-making processes.

**Mr. Greig Oldford:** I can share my reflections on what I'm hearing today, which is that it's very difficult to tease apart cause and effects in situations where we see a lot of correlation. I think scientists and researchers struggle with that, and politicians and managers will be struggling with that kind of an issue for a long time.

Nonetheless, as other witnesses have mentioned, there are mechanisms such as the weight of evidence approach. There's the precautionary approach, as well, that can help us navigate the situation when uncertainty is always there.

**Ms. Lisa Marie Barron:** Thank you very much, sir.

I have another question for Dr. Mordecai.

I'm wondering if you can share a little bit about any international standards that we should consider in our processes. I'm thinking, for example, of the Magnuson-Stevens act in the U.S.

Could you expand a little bit on that? Thanks.

**Dr. Gideon Mordecai:** Yes. I'd like to reflect on the last comment as well, and just say that a causal relationship isn't required to make a precautionary decision.

What you asked is true. Internationally, there are fisheries science review processes that incorporate independent science advice in the fisheries management. There are examples we can look to in the U.S., the EU, Australia and New Zealand, which have that independent aspect to them.

I'd say that Canada is falling behind internationally in that sense. Obviously, not all of these processes are necessarily immune to political interference, but the fact that you have an independent body is at least a step in the right direction. If there's some transparency in the way those decisions are made, it makes it much easier for other scientists looking in from the outside to review how these decisions are being made.

In Europe, they have groups of experts that are appointed by an independent commission for three years, who provide scientific advice on fisheries management. I think this is similar to the kind of example that Dr. Reynolds was putting forward with COSEWIC.

**The Chair:** Thank you, Ms. Barron.

We'll now go to Mr. Perkins for five minutes or less, please.

**Mr. Rick Perkins (South Shore—St. Margarets, CPC):** Thank you, Mr. Chair.

Thank you, witnesses. This has been fascinating so far.

My first couple of questions are for Dr. Reynolds, as chair of the Committee on the Status of Endangered Wildlife in Canada, which we all call COSEWIC.

Obviously we're most interested here in the aquatic species element of what you do. When there is a consideration going on within your process, is it possible that a species would have perhaps some sort of endangered status at one part of the country and not another? Does your process allow for that distinction?

• (1250)

**Dr. John Reynolds:** Yes. It does happen that species have different statuses in different parts of the country, especially in such a large and diverse country as ours.

We look for the overall national status. We ask, all things considered, how are they doing? For example, peregrine falcon are doing extremely well in nearly all of the country, but there are certainly some places where they have not recovered from pesticides. Overall, the peregrine falcon, as a species, was deemed by my committee to no longer be at risk of extinction. Therefore, we don't need to be running that through the federal program. There are—

**Mr. Rick Perkins:** That's a great example. In that example, even though it may be endangered in one part, you still did an overall designation.

If I were to bring up elvers—something that I think is before COSEWIC right now—we know they have some challenges in the Great Lakes, and mainly because of hydroelectric dams throughout Quebec and Ontario preventing their migration and spawning routes. In Atlantic Canada, elvers are very healthy.

I've been told by the minister that any consideration of it by COSEWIC has to be done uniformly across the country. Would you say that that's incorrect?

**Dr. John Reynolds:** It is correct. We would be considering all of the separate populations and how they're doing in different places, and then ask overall, how is that species doing on a Canada-wide basis?

**Mr. Rick Perkins:** Okay.

**Dr. John Reynolds:** May I add one thing that I should have said?

**Mr. Rick Perkins:** Please do.

**Dr. John Reynolds:** We consider species below the species level. We can look at subspecies or at genetically distinct populations.

For example, the fish in Atlantic Canada are bound to be genetically distinct, or they may well be genetically distinct, from ones in the Great Lakes. In that case, we would look at those two “subspecies”, we could call them, albeit we actually call them “designatable units”, and assess each of those separately. It's possible for one of them to then be listed for protection under the Species At Risk Act and the other one could be deemed not to be at risk.

**Mr. Rick Perkins:** Thank you very much. That's very important, because in the study that's ongoing now, that's the distinction I've been trying to make, but the department.... I'm not getting very far on that.

Do you have any idea of the timing and how long this is going to take? There are a lot of commercial businesses at stake in Atlantic Canada.

My understanding is that there will be some elver decisions made by the Food and Drug Administration this year in the United States that are going to allow for the growth and development of the elver business in the U.S. very quickly. We may be left behind if we aren't through the consulting process soon.

**Dr. John Reynolds:** I see. I would have to check with the secretariat, because the spring meeting's going on right now. I can provide that information to the committee after this hearing, if you like. I can see at exactly what stage in the process we are. At any given time, we have about 100 species working their way through our process, so I don't know off-hand.

**Mr. Rick Perkins:** That would be great. Thank you.

My next question is for Dr. Robert. You mentioned that the quality varies between species, particularly in what you've been used to in Atlantic Canada and the research that's been ongoing. I'd like to talk about a couple of issues.

When you have pelagic fish, obviously, having a full acoustic sounding of the biomass is very helpful. When you do it and what the water temperature is when you do that, or spawning biomass, is very important. There are a number of important species, such as Atlantic mackerel—which we just saw the department close down—that do not have acoustic sounding. The examination of the science over the spawning sampling that DFO's been doing over the last decade has shown that they're actually sampling with water that's at 8°C in the Gulf of St. Lawrence and not at the 10°C to 13°C that's required for spawning. It is underestimating the potential size of the biomass.

Could you comment? Is that one of the areas of species where we are a little short on the quality of the science?

• (1255)

**Dr. Dominique Robert:** You're right. Atlantic mackerel doesn't have an acoustic survey, but given its biology, it's not the best species to consider with acoustics. It doesn't have a swim bladder, so it's not a good acoustic target.

However, the department runs an egg survey. They monitor the number of eggs spawned during the short spawning season in the southern Gulf of St. Lawrence. As you mentioned, the spawning can vary a bit from one year to another, depending on the temperature. The survey doesn't vary in time, but there is sampling of the females, as well, to account for and correct the mismatch. I know that the department has explored other potential spawning areas, like the west coast of Newfoundland and Nova Scotia.

In my view, the survey for the Atlantic mackerel biomass is a good one, compared to many other forage fish stocks. There is uncertainty, but when I read the stock assessment reports, I very much trust the conclusions about its abundance and the fact that the adult mortality component is too high right now.

**The Chair:** Thank you, Dr. Robert.

We've gone way over with Mr. Perkins.

We'll go now to Mr. Morrissey for five minutes or less, please.

**Mr. Robert Morrissey (Egmont, Lib.):** Thank you, Chair.

I want to follow up with Dominique Robert on the same issue, because it's one that's very current today in Atlantic Canada.

Would I be interpreting you correctly that the decision made by the department and the minister as it relates to closing the mackerel fishery was a sound decision and in the best interests of rebuilding the stock?

**Dr. Dominique Robert:** Yes. That's what I've concluded. The stock's level of biomass is very low. The issue is not only with commercial fishing; it's also with the bait fishery, which is not well accounted for in all regions. It's difficult to estimate the mortality through fishing.

This is DFO science. We know that the status of the ecosystem is not very favourable right now for the production of good year classes to replenish the stock. The way to go is to create as much fishing pressure as possible and allow a certain level of biomass to remain. That certain level of biomass, when the conditions get back to something better, will be able to generate some new cohorts.

The decision is good, but it could probably have been made with more planning and, maybe, before this year. I think it came as a surprise to the industry, and it was not a good surprise.

**Mr. Robert Morrissey:** Thank you, Dr. Robert.

Following up on that, my concern is with the management of the fish stock as it relates to the fishers, workers and communities, because they depend on government—the DFO—getting it right.

How would you recommend to this committee that government bridge the conflict between fish harvesters, local observations and the DFO science?

As you just said, it wasn't well received, but from the independent scientific data you've examined, the department made a prudent decision for the long-term sustainability of the resource that our communities and fishers depend on.

Could you comment?

**Dr. Dominique Robert:** Yes, sure. One of the options that could be considered is a branch for social sciences within the department because, really, sometimes we tend to forget that a fish stock is not just a fish stock. It sometimes represents the vitality and the economy of some communities. Just looking at the numbers and stopping a fishery of course will affect and will impact people.

I'm not a social scientist myself, but there must be ways to prepare communities: for example, perhaps by redesigning the system and allowing people to fish several species, so that when one is doing poorly, perhaps we can have some resilience by exploiting other species that are doing better.

That's a bit of the problem right now in Atlantic Canada. The system is shifting from a cold one to a warm one. Some of the species are disappearing quickly and some others are booming. It's a sort of a regime shift, and this brings some uncertainty for our fishing communities.

• (1300)

**Mr. Robert Morrissey:** Could you comment on how there's been a lot of testimony given about an independent science branch within DFO, and could you present an answer in writing to the committee later? How would you advise the committee that an independent science branch that were only focused on science would

then interpret the information from the knowledge base, which is the fishers and indigenous communities and take it into account? How would it work? I know that I don't have time now, but I'd be curious to know if you have an opinion you could provide to the committee on paper.

Thank you, Dr. Robert. Your evidence is fascinating.

**The Chair:** Thank you, Mr. Morrissey.

We'll now go to Madame Desbiens for two and a half minutes, please.

[*Translation*]

**Mrs. Caroline Desbiens:** Thank you, Mr. Chair.

I'll continue with Dr. Robert.

Dr. Robert, you talked about your thesis on fish, particularly herring and mackerel. How long have you been reading about a reduction in the biomass, in the resource?

**Dr. Dominique Robert:** In the case of mackerel, the last strong year class we saw was in 1999, which was the basis of my thesis. Since that time, we have had moderate cohorts. Since the beginning of 2010, there have been only small cohorts. For at least 10 or 12 years, recruitment has been very low and the number of adults has been declining.

In the case of spring herring in the southern gulf, it's been longer. We've seen a decline since the early 2000s. Herring is a species with two spawning stocks, one in the spring and one in the fall. Often warm periods are unfavourable for spring herring, not surprisingly.

**Mrs. Caroline Desbiens:** Tell me, has your thesis been submitted? Was it considered by the department 10 years ago, or when you completed it?

**Dr. Dominique Robert:** This goes back a few years. My research was fundamental and aimed at understanding the link between larval growth and survival. We now know that the strong cohorts really emerge at the larval stage. These are the factors that favour or disadvantage larval survival and really affect the stocks that can be fished four to five years later.

Right now, the conditions for recruitment in the southern gulf are not there for mackerel, but the system is very variable. We can hope that the stock will be able to come back, but we have to take care of it.

**Mrs. Caroline Desbiens:** My time is up, isn't it, Mr. Chair?

I have enough questions for the whole afternoon.

[*English*]

**The Chair:** Thank you, Madame Desbiens. There is only seven seconds left in your time.

We'll now go to Ms. Barron for two and a half minutes, please.

**Ms. Lisa Marie Barron:** Thank you, Chair.

Before I ask my first question, I want to clarify, is it Ms. Moran or Dr. Moran? I want to make sure I'm using the right title.

**Dr. Kathryn Moran:** It's Dr. Moran.

**Ms. Lisa Marie Barron:** Thank you, Dr. Moran.

Dr. Moran, you spoke quite a bit about the importance of having open and freely available data and that it was a core foundation for informing policy and management. We had chief science adviser Dr. Mona Nemer here last week, who highlighted some of the challenges in having open and available data.

I'm wondering if you could speak a bit more about how Ocean Networks Canada uses government data and how a more transparent system would help in your efforts.

• (1305)

**Dr. Kathryn Moran:** Thank you for that question, because I'd like to bring up some experience we've had with DFO.

After the Baum and Fuller report "Canada's Marine Fisheries: Status, Recovery Potential and Pathways" came out in 2016, DFO Pacific science worked with us. We actually developed what we called a "fishery science reporting system" that addresses the recommendations from that report and addresses some of the comments here from the other witnesses. In fact, it provides scientific information, trajectory information about species, economic value, abundant species, life-cycle information, geography, etc. It also links to all of the open data, both in the federal government and in academic publications.

We developed it. Because we are a big data enterprise, we were able to develop this tool. We were on to phase three and there has been no action since 2018. We see this as a national tool that could begin to open this transparency. It would begin to look like what the U.S. NOAA does in their fishery service. They actually have a very open and transparent delivery of data across all species, called Stock SMART. This would allow all of us to have that information, including the lack of assessment data, which I think has been brought up here again.

I think this could be a way forward. We'd be happy to work again with Fisheries and Oceans science across the country to advance this tool, to open up that transparency, so that everyone understands on both the social science side and the hard science side what the gaps are in that information and what kind of risks we are taking in making these decisions.

I also want to touch on the fact that there was a comment about where we bring in the fishers themselves. There's a model in the U.S. called Sea Grant where, in fact, they are really funding regionally the interests of the fishers—what science they need to help them advance their economic benefit. That might be a model to look at going forward.

Finally, I'd like to comment on the fact that we will not have a lot of ships to capture a lot of these data in the open ocean and in some of the coastal areas, and we are not now moving forward with looking at systems, autonomous surface vehicles, because we can no

longer afford to operate these vessels with people on board. This is the future and it's been advancing in the past three years. There are many publications on how these autonomous vehicles are now being used for stock assessment and understanding of evolution of species as the climate changes.

Thank you.

**The Chair:** Thank you, Ms. Barron.

We'll now go to Mr. Small for five minutes or less, please.

**Mr. Clifford Small (Coast of Bays—Central—Notre Dame, CPC):** Thank you, Mr. Chair.

First of all, Mr. Chair, I'm going to direct a question to Mr. Oldford.

Thank you very much, Mr. Oldford, for taking the time out of your busy schedule to come here and help out with our study.

I heard you mention that there's been a big decrease in salmon population in the Salish Sea since the 1970s. What year did the United States bring in the Marine Mammal Protection Act?

**Mr. Greig Oldford:** I'm not 100% sure what year it was, but my guess is that it was in the early 1970s.

**Mr. Clifford Small:** Maybe it was 1972. I'm not sure, but it was in the 1970s.

Prior to the introduction of the Marine Mammal Protection Act... We all know that pinnipeds are big predators of salmon. Do you think that basically the elimination of controls on the pinniped population has affected predation in coastal British Columbia?

**Mr. Greig Oldford:** I can attempt to answer your question.

The facts that we know about pinnipeds in the Salish Sea are that the numbers have increased since the early 1970s. There may have been around a couple of thousand of harbour seals, for example, and today there may be more like 40,000 or so. There's been a very big increase.

This has happened in parallel with many of B.C.'s other marine mammals, such as killer whales, sea lions, sea otters and humpback whales. Bigg's killer whale or West Coast transients are predators of pinnipeds as well, so there's been a big increase in the numbers of those groups.

You mentioned that they prey upon salmon. We do know it is a fact that juvenile coho and chinook may comprise 1% to maybe 6% of the harbour seal's diet. There's some uncertainty there. For pinnipeds in B.C., unlike for most predators, we do have a good long-term time series on the numbers.



• (1310)

**Mr. Clifford Small:** I realize that the salmon doesn't make up a big part of the pinniped diet, but it doesn't have to be much when you have species under threat like steelhead and salmon in B.C.

Do you think the minister has had a recommendation made to her that there should be some type of management of pinniped populations to protect salmonid species in British Columbia and, in fact, in Atlantic Canada as well?

**Mr. Greig Oldford:** Yes. My understanding is that that's been proposed or brought forward to the minister.

**Mr. Clifford Small:** That's interesting.

My next question, Mr. Chair, is for Mr. Reynolds. He spoke a lot about sea lice. If I were a salmon, I'd be much more afraid of a pinniped chasing me than a sea lice. You also talked about trade-offs in some of these management decisions. Could you give us an example of a trade-off that might be made in terms of addressing the risk of pinnipeds on salmonid populations?

**Dr. John Reynolds:** You're looking for what would be the downside of controlling pinnipeds?

**Mr. Clifford Small:** I heard you mention people harmed by trade-offs and decisions. What human aspect would there be to controlling pinniped populations?

**Dr. John Reynolds:** I'm not sure. I'm not an expert on pinnipeds. I've never studied them, so I'm not really sure what the trade-off would be there. But I can see where you're coming from when we compare, say, the trade-off of livelihoods affected by reduced fishing and so on. I don't see those sorts of trade-offs but otherwise I suspect perhaps the biggest barrier might be the concern of many members of the public who like pinnipeds.

**Mr. Clifford Small:** They'd have hurt feelings.

**Dr. John Reynolds:** Yes, and how the minister weighs that, of course.... That's a tough question to deal with and not really a scientific one.

**Mr. Clifford Small:** Well, we're all creatures.

**The Chair:** Thank you, Mr. Small. Five minutes doesn't last long when you're having fun.

We'll now go to Mr. Hanley for five minutes or less.

Go ahead, please.

**Dr. John Reynolds:** Mr. Chair, I'm sorry. It's John Reynolds.

**The Chair:** Yes.

**Dr. John Reynolds:** I'm sorry, but unfortunately I really do need to return to my COSEWIC meeting, so if it's okay, I would like to be allowed to be let off the hook here.

**The Chair:** Yes, it's a good analogy for this committee to let someone off the hook.

**Voices:** Oh, oh!

**The Chair:** Thank you for your participation. It was greatly appreciated and feel free to sign off whenever you want.

We'll now go to Mr. Hanley for five minutes or less.

Go ahead, please.

**Mr. Brendan Hanley (Yukon, Lib.):** My thanks to Mr. Reynolds and the rest of the fascinating witnesses. To think that six months ago I wouldn't have been able to tell you what a pinniped was.

Mr. Chair, I will be sharing my time with Ms. May, so I'll have two and a half minutes.

I want to go back to Mr. Oldford.

Thanks for being here. I notice in your profile that your research interests include parameter estimation, uncertainty analysis and modelling ecological networks. It seems that one of the linchpins for how science in DFO gets translated into options and recommendations is through this scientific advice report. But where you have varying quality of science and uncertain data, I wonder if you can describe some of the challenges in collating uncertainties and inconsistencies into advice based on science, and how you would use the tools such as uncertainty analysis and parameter estimation to inform that advice.

**Mr. Greig Oldford:** It isn't easy to navigate. Especially in ecology, the time series and data we have are often very sparse, though we are starting to see good examples of long-term time series available for us to work with and are trying to incorporate them into the models. Often those time series and those observations don't come with a good understanding of exactly what the error is in them, so there is some struggle there putting, for example, a probability or a precise likelihood to, say, a management strategy that management wishes to evaluate. There are ongoing challenges with that and I think it's just something that may always be there.

The other thing I'd like to say about it is almost a caveat. The simulation modelling and computer modelling does play an outsized role in marine ecology, partially because you can't isolate variables. You can't do controlled experiments as easily. They are just models at the end of the day.

• (1315)

**Mr. Brendan Hanley:** Yes. Thank you very much.

I'll now cede my time to Ms. May.

**Ms. Elizabeth May (Saanich—Gulf Islands, GP):** Thank you so much, Dr. Hanley, for giving me some of your time.

I'm, with two and a half minutes, ambitiously going to try to put two questions to two different witnesses, so here's to hoping.

First to Dr. Moran, your evidence and recommendations to this committee, drawing on your experience in the White House, included that we look at what we could do better about our most neglected ocean coastline and ocean in the Arctic. Dr. Robert also referenced that the data deficiencies for Arctic fisheries are quite high.

Could you briefly cover in a bit more detail what you think the federal government should be doing in relation to the Arctic?

**Dr. Kathryn Moran:** Yes. Thank you.

Very briefly, I think there are many interests across federal departments in the Arctic. As we've experienced at Ocean Networks Canada, we operate infrastructures that benefit many federal departments. We need to use our dollars wisely to put in as many autonomous systems as possible in the Arctic that then deliver information across those mandates. For example, situational awareness is critical in the Arctic, as is understanding the changing climate and as is understanding the fisheries. It's about getting those players together, identifying the needs and then putting in systems.

In many areas along our coast, many systems have to be autonomous to actually gather that information.

**Ms. Elizabeth May:** Thank you.

I've been fortunate, committee members, to have visited Ocean Networks Canada frequently and it's mind-blowing to see what their equipment is capable of doing at sensing on the ocean floor.

My question for Dr. Mordecai is to pick up on his comment that there is a conflict of interest problem that is suppressing science in DFO, particularly in relation to PRV, and also to sea lice. We also heard evidence of suppression of science on Fraser steelhead in the interior.

Dr. Mordecai, maybe it's not something you can actually speculate on, but what the heck would be the conflict of interest within the department that's supposed to protect our fisheries and our coastline, which ends up deciding to have decision-based evidence making, instead of what we want, evidence-based decision-making?

**Dr. Gideon Mordecai:** I'd say the conflict would go down to the duality in the mandate of DFO, which is to obviously look after wild fish and fisheries, but also to regulate and promote the aquaculture industry. There will be cases where those things come head to head, and that is where the conflict comes about.

**Ms. Elizabeth May:** My time is up. Thank you, Mr. Chair.

**The Chair:** You've gone over slightly, but we'll forgive you for that today.

We have to close off now at this point because, of course, Mr. Zimmer has provided us with a notice of motion that we have to deal with.

We'll say thank you to our witnesses for their informed participation here at committee today. It's been absolutely fantastic testimony and information. It's been very good, including the part on the seals and the sea lice.

I'll give our witnesses a moment to sign off and we'll go into a bit of committee business for Mr. Zimmer's motion.

I think everybody has signed off, Mr. Zimmer, but what I will say from the outset is that being that your notice of motion wasn't the topic for today—

**Mr. Bob Zimmer (Prince George—Peace River—Northern Rockies, CPC):** Yes.

**The Chair:** —I'm going to ask for unanimous consent for you to be able to move your motion. I don't think you'll find much of a problem with that.

Do I have unanimous consent for Mr. Zimmer to move his motion?

All right.

You're good to go, sir.

• (1320)

**Mr. Bob Zimmer:** Thank you, everybody.

I trust that you've seen the motion. We sent it out last week. I'm just going to read it:

That the committee request the Parliamentary Budget Officer prepare research and comparative analysis on the Estimates for the Department of Fisheries and Oceans beginning at least as early as 2015-16 to 2022-23; and that the committee request that this research and analysis be submitted to the committee within 60 days following the adoption of this motion.

Really, the gist of it, folks, is what's typical practice in my office. We meet the PBO, especially in my role as critic—I'm critic for other files—and we just have a little conversation with the PBO. We'd asked some questions about Fisheries and Oceans, in that this comparative analysis had not been done, and I would need to come to committee just to make the request to get them to do their work on it.

I don't think there's anything in there that should be a concern to any of us, other than just having a simple look at what those expenditures are.

I think Ms. Barron had a comment she wanted to make, through the chair.

**The Chair:** Ms. Barron, you have your hand up.

**Ms. Lisa Marie Barron:** Yes. Thank you.

Chair, I have a question for Mr. Zimmer and also an amendment that was sent out. Perhaps I'll ask the question first and then wait for you to let me know when I can speak to the amendment.

I'm curious to know what the next steps would be after this motion. Are we looking for the Parliamentary Budget Officer to appear and speak to the information that's being gathered? What are the next steps that would come?

**Mr. Bob Zimmer:** I don't believe that's part of the process. This would just be offering us the document of what he comes up with. The PBO is beyond one person—it's a department—but we would just be asking for that document to be provided.

I don't envision him appearing. That could be part of it, but that's not what the motion is asking for.

**Ms. Lisa Marie Barron:** Okay. Thank you.

**The Chair:** Basically, it's asking for them to prepare a report based on the motion.

**Mr. Bob Zimmer:** Yes. That's right.

**Ms. Lisa Marie Barron:** Thank you.

Could I speak to the amendment?

**The Chair:** Yes. The motion has been moved. You can certainly move an amendment.

Go ahead, Madame Desbiens.

[*Translation*]

**Mrs. Caroline Desbiens:** I just want to point out that we haven't received the amendment. It would be good to have it in both official languages.

[*English*]

**Mr. Bob Zimmer:** She's asking about the amendment. She hasn't received it because it hasn't been made yet.

**Ms. Lisa Marie Barron:** To clarify, it is my understanding that the amendment has been received by the clerk.

**The Chair:** Yes, but she can't distribute it until you move it.

**Ms. Lisa Marie Barron:** Can I move the amendment, please?

**The Chair:** And the amendment is....

**Ms. Lisa Marie Barron:** Do you want me to read the whole thing?

I'll read the whole thing, which includes the change:

That the committee request the Parliamentary Budget Officer prepare research and comparative analysis on the Estimates for the Department of Fisheries and Oceans beginning at least as early as 2011-2012 to 2022-23; and that the committee request that this research and analysis be submitted to the committee within 60 days following the adoption of this motion.

So it would change "2015-16" to "2011-2012".

Chair, can I speak to the amendment?

**The Chair:** You can, I guess, if you want to explain why you're doing the amendment.

**Ms. Lisa Marie Barron:** Thank you. I just want to make sure I'm following the process.

This is a very minor change. It's just a change of dates. The rationale is that I support the motion, and agree that we need a compara-

tive analysis. We know that we see change happen very slowly from decisions that we make today. They might take many years to come to fruition. I think having it extended in length will provide us with a more fruitful piece of information.

**The Chair:** We've all heard the amendment and the explanation for it.

I know that we're getting tight on time to get this through. I'm not seeing any hands up for any further discussion.

Can we have a vote on the amendment, please? That's unless it can be adopted unanimously, or on division, or....

All thumbs are up.

(Amendment agreed to)

(Motion as amended agreed to)

**The Chair:** Those were both unanimous. Excellent. We should have such an easy time on all votes.

**An hon. member:** It's all because of the chair.

**Some hon. members:** Oh, oh!

**The Chair:** Oh, definitely.

Go ahead, Mr. Arnold.

• (1325)

**Mr. Mel Arnold:** Before you adjourn, Mr. Chair, as we're proceeding with the science study, I would like to ask whether the minister has been invited to this current study yet.

**The Clerk of the Committee (Ms. Tina Miller):** I thought the understanding was to have her near the end of the study. Because the time has been spread out a bit because of draft reports, it will be a little while. I don't know when exactly, but near the end for sure.

**Mr. Mel Arnold:** Thank you very much.

**The Chair:** Thank you, Mr. Arnold.

**Mr. Bob Zimmer:** I just want to say thank you, Mr. Chair, and thank you, everybody.

**The Chair:** That's not a problem. Thank you, Mr. Zimmer.

I want to give a big thank you to all of the staff involved in today's meeting, especially our interpreters, clerk, analysts, and everybody who supports us individually.

The meeting is adjourned.





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