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November 13, 2020

Victoria Postlethwaite and Jim Meldrum
Fisheries and Oceans Canada
1420-401 Burrard Street, Vancouver, BC
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Subject: MCC recommendations for 2020/21 Strait of Georgia herring fishery.

Dear Victoria Postlethwaite and Jim Meldrum,

The *Pacific Marine Conservation Caucus* (MCC) is submitting this letter in response to the public consultation regarding the 2020/2021 Food and Bait and Special Use Pacific Herring Commercial Plans (winter fishery). While our comments are being submitted as part of the winter fishery IFMP consultation, they are more appropriately directed at the management of Strait of Georgia herring as a whole including the roe fishery.

In short we recommend that Fisheries and Oceans Canada (DFO) adopt the key elements of the Management Procedure scenario endorsed by the MCC (i.e., HS30-60_HR.1). This scenario incorporates key elements of an ecosystem based fishery through: (1) strengthened conservation and biomass objectives, (2) risk averse harvest control rules, and (3) managing for uncertainties in the spatial structure of herring populations.

Although this submission falls within the consultation period of the winter fishery, it should be noted that it is inappropriate for DFO to decide on the management, harvest rates, and total allowable catch permitted for the winter fishery without first confirming the direction with respect to the seven proposed management procedures for the Strait of Georgia fishery as a whole as described in the recent preapproved CSAS document. While it is understandable that industry requires a timely decision in order to carryout a winter fishery, the food and bait TAC decision may influence what options will be considered for the roe fishery.

First Nations Rights and Titles

Participating organizations of the MCC support the government of Canada upholding the legal and constitutionally enshrined rights of Indigenous peoples. To that end we acknowledge that the government of Canada must work with First Nations that have an interest in Pacific herring, recognizing that a single approach may not be suitable for all Nations.

Management Procedure Supported by the MCC: 'HS30-60_HR.1'

In November 2019 the MCC submitted a letter to DFO outlining several elements required to transition toward an ecosystem based fishery (Appendix A). DFO science recently modeled some of these elements through the management strategy evaluation process (DFO 2020, Draft pre-approved). The scenario which best characterizes an ecosystem based fishery as put forward by the MCC is the Management Procedure (MP) referred to as HS30-60_HR.1.

Strengthening the conservation (LRP) and biomass objectives

A fundamental requirement to transition to an ecosystem based fishery is to increase the overall conservation and biomass objectives. In comparison to other species, Pacific herring are thought to have a disproportionate ecosystem role through their large biomass and relative importance in the diets of a wide range of predators. To maintain this ecosystem role, albeit inherently impossible to fully comprehend, requires a management system with a primary objective that aspires to maintain the populations of herring to a level at least equivalent to their long term average biomass. The current management system is still fundamentally characterized by conventional fisheries goals that aim to allocate a total allowable catch (TAC) at the highest level possible while not causing the population to decline below a low biomass (limit reference point). Forage fish like herring require management goals that extend beyond a single species management frame and consider a broader range of ecosystem and societal values.

The MCC proposal submitted in 2019 recommended that herring biomass in the Strait of Georgia be maintained above the long-term average spawning biomass with 75% or greater probability. The 2020 DFO modeled Management Procedure reflecting the MCC proposal was a MP that aimed to maintain spawning biomass at 60% of the unfished biomass with greater than 50% certainty (Appendix B). Although the modeling found that maintaining a high biomass level was difficult to maintain under varying natural mortality assumptions it did provide a valuable precautionary frame of reference for managing herring. That is, maintaining biomass equal to or above an average level will require a prescribed change in the harvest strategy. A reduced harvest rate to 10% of the spawning stock biomass and raising the conservation LRP would increase the probability of achieving this ecosystem based biomass objective.

Operationalizing risk averse harvest control rules to integrate ecosystem considerations

The Lenfest Forage Fish Taskforce concluded that (1) reducing the harvest rate, (2) implementing a "hockey stick" or linear decline harvest rate control rule, and (3) maintaining a minimum biomass

objective of 0.4 B_0 were the best management procedures to address ecosystem considerations. The 2019 MCC proposal recommended a reduced harvest rate of between 5 and 12 per cent of the spawning stock biomass and a linear decline harvest rate control rule.

A proxy MCC recommendation was modeled by DFO science using a 10% maximum harvest rate with a linear decline harvest rule between the operational control points of 0.3 and 0.6 B_0. Even under this more conservative harvesting regime, the model did not meet the biomass objective of $0.6B_0$ under varying natural mortality conditions but it performed much better than the status quo. The current operating model is unable to meet objectives required for a forage fish fishery in an ecosystem based fishery management frame. We recommend more risk averse control rules such as those supported by the MCC.

Acknowledging uncertainties in the spatial structure of herring populations

The spatial structure of populations is the most debated issue within the management of Pacific herring. A better understanding of the spatial structure is important ecologically and also with respect to FSC fisheries. While genetic and tagging evidence largely supports the concept of a large intermixing population through most of Canada's Pacific waters, the timescale of this intermixing does not necessarily occur within the timescales required to manage for more discrete population structuring or to maintain fishing opportunities in some areas, particularly FSC harvest. In other words, local spawning areas appear to have some persistence over time but may not be genetically distinguishable as they may be a result of environmental conditions in any time period or mediated by unknown behavioural mechanisms.

Under this type of scenario a local aggregation could be overfished and thereby limit the opportunity for that location to be utilized in subsequent years. Perhaps advancements in population delineation through genetic or other means may eventually yield practical solutions, but in the near term (i.e., <10 years) this is unlikely.

While there are no spatial objectives in any of the current MSE scenarios, the MCC supported scenario in combination with existing and proposed spatial closures provides the highest probability for herring to maintain spawning areas and potentially use new or historical locations.

Recommendation for 2020/21 Pacific Herring Integrated Fisheries Management Plan:

The MCC recommends an intentional transition of Pacific herring management toward an ecosystem based fishery through lowering the harvest rate and implementing operational control points to maintain the biomass at a higher level. This approach will reduce risk to herring and reliant predators, acknowledge uncertainties in the population structure, and maintain fishing opportunities within the context of an ecosystem based fishery. For the 2020/21 Strait of Georgia herring fishery the MCC MP (HS30-60_HR.1) is the best-suited option to achieve these objectives.

Thank you for considering these options. We look forward to hearing your response.

Sincerely,

Scott Wallace, Ph.D.

Senior Research Scientist, David Suzuki Foundation
Integrated Herring Harvest Planning Committee, MCC Representative

On behalf of the Pacific Marine Conservation Caucus

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Appendix A: 2019/20 IFMP Letter from the MCC

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November 22, 2019

Victoria Postlethwaite
Fisheries and Oceans Canada
1420-401 Burrard Street, Vancouver, BC
V6C 3S4

Subject: Toward a "low risk" ecosystem based Pacific herring fishery

Dear Victoria Postlethwaite,

As the *Pacific Marine Conservation Caucus* (MCC) representative on the *Integrated Herring Harvest Planning Committee* (IHHPC) I am submitting this letter to highlight concerns with respect to the proposed harvest for the 2019/2020 Pacific Herring Integrated Fisheries Management Plan and to recommend considerations toward a "low risk" ecosystem based fishery.

I have held a seat on the IHHPC for 13 years. Throughout this tenure, I have endeavoured to understand the strengths and limitations of the management system, complexities of ecosystem considerations, and the breadth of socioeconomic and cultural values associated with herring.

Concerns first raised with the Committee over a decade ago (i.e., in-season management, population structure, risk of over-harvest, and ecosystem considerations) are still present today and many of these concerns are fueling the public opposition to the Strait of Georgia component of the fishery. There is a range of First Nation's perspectives which we acknowledge and respect.

The growing public concern reflects a perspective that the fishery imposes too large a risk to herring populations and the associated ecosystem linkages than what is deemed appropriate through the lens of an ecosystem based fishery.

Toward a low risk ecosystem based fishery

The management of herring requires addressing challenges not apparent in most other commercial fisheries in Canada's Pacific waters, in particular, the widely held scientific and public understanding of the ecological importance of herring. While the precise ecological linkages are impossible to ascertain due to the complexity and non-linearity of marine ecosystems, the public interest reflects the findings borne out in ecosystem models, that herring, in comparison to other species, disproportionately transfer

ecosystem energy into higher trophic levels. Higher trophic levels tend to be comprised of species that interface with public value (e.g., seabirds, marine mammals, other harvested fish).

When using conventional fisheries management metrics to evaluate the sustainability of the Pacific herring fishery, such as those identified by DFO's *Sustainable Fisheries Framework* precautionary approach or even eco-certification schemes like the Marine Stewardship Council (MSC) or Seafood Watch, the performance of the Pacific herring fishery generally meets these criteria. However, these sustainability rubrics are primarily a measure of conventional fisheries management and not ecosystem based fisheries management. For a species like herring with high public value stemming from its role in maintaining ecological values at other trophic levels, conventional fisheries management is insufficient.

The revised *Fisheries Act* states that the "Minister may consider, among other things, (a) the application of a precautionary approach and an ecosystem approach" as the first listed considerations for decision making. These considerations come before the "sustainability of fisheries" (s. 2.5(a) (b)). The challenge is to transition toward an ecosystem approach to fisheries management in the absence of policy guidance.

A practical way to translate the best practices of ecosystem based fisheries management into feasible implementation is to utilize the management strategy evaluation (MSE) process for herring with a view toward managing the herring fishery as if it were an emerging fishery under DFO's *Policy on New Fisheries for Forage Species*.

The forage species policy has never been applied in Canada as it was intended for "new" fisheries. It is unlikely that any new forage fish worthy of a fishery will spontaneously appear in our ecosystems. The policy sits idle as a reminder of what Fisheries and Oceans would do differently if it were to start managing a new forage fish fishery. If the Pacific herring fishery were to be hypothetically considered as a *new* fishery using the principles of DFO's policy for new forage fisheries, the herring fishery would necessarily be managed under a more risk averse management regime. We recognize that if the policy was implemented to its full intent, it would be difficult to ascertain the knowledge requirements to undertake the fishery at all. But the policy provides important guidance on how to move the fishery so that ecosystem considerations become a primary focus.

The MCC believes that the fishery needs to be managed so that ecosystem requirements are the primary objective. This requires reducing the harvest risk profile which by proxy elevates the ecosystem considerations. The 2018/19 IFMP acknowledges that there is a "moderate likelihood that herring fisheries are driving the status of stocks" and that there is "a moderate to high potential to over-harvest in this fishery". This level of risk would necessarily be reduced through the lens of an ecosystem approach.

In this submission we are proposing five considerations toward a "low risk" ecosystem based fishery using the structure of the MSE and the more practical (i.e., implementable) principles of the SFF forage fish policy to guide our immediate recommendation for the 2019/2020 IFMP and provide context for future discussion and changes to management.

1. Increase the lower LRP to reflect an ecosystem based conservation objective

Upholding a minimum spawning biomass is a key principle of the *Policy on New Fisheries for Forage Species* (Principle 3) and a central aspect of any fisheries management regime. The present guiding conservation biomass objective of a lower limit reference point of $0.30B_0$ with 75-95% probability is too low a starting point for managing a forage fish species with an ecosystem based approach. Under the guidance of the SFF forage fish principles, the biomass LRPs should ensure both that *future recruitment of the target species is not impaired, and that food supply for closely linked or ecologically dependent marine predators is not depleted* (Principle 4).

There are no broadly accepted numerical translations of this principle to use as guidance. A reflection of this principle as a conservation objective using the current MSE would be something along the lines of $B_t > B_{ave}$ with a 75% or greater possibility under all plausible natural mortality scenarios. In other words, the overall conservation and lower limit reference point objective would be aligned to maintain the average long-term observed biomass of the herring population with a high degree of likelihood under modeled conditions.

We recommend that the Department re-evaluate the reference points and exploitation rates with an objective toward maintaining the average long-term biomass with a high degree of certainty.

2. Lower the exploitation rate

Pacific herring are currently managed with a target harvest rate of 20% of the spawning stock biomass. While this management approach may serve the purposes of managing herring as a conventional single species fishery, it is too high of a harvest rate and too rigid to meet the principles of ecosystem based fisheries management. Target exploitation rates approaching 20% may be appropriate under extremely high biomass and recruitment conditions in combination with other management procedures but in a scenario of declining biomass with poor in-season monitoring, this rate imposes a high risk of over-harvesting. Forage fish fisheries globally are managed with a wide range of exploitation rates, however those recognized as being more precautionary and ecosystem based have maximum rates around 12% (e.g., Norway herring, F=0.05-0.125). We recommend further exploration of appropriate management procedures and reference points that would utilize a linear decline ratio (i.e., hockey stick harvest rate) centred around meeting the conservation objective described above to reduce the likelihood of causing further declines to the spawning stock biomass. As further discussed in (4) below, the harvest rate needs to be adjusted to appropriate spatial scales of spawning locations.

3. Plan for a lower biomass and harvest rate until validated with in-season management

A continued criticism of the fisheries management system for herring is the lack of a dependable in-season methodology to validate the mid-range of the forecast used to determine the harvest. The 2019 season exemplified this problem. While forecast errors go in both directions, the consequences of an under-harvest do not compromise an ecosystem based conservation objective. Some accepted variability between the expected and actual spawning biomass is a reality of any fisheries model and management system. However, during a period of declining SSB and increasing natural mortality, as is

the current situation, overestimating the SSB can have negative long term consequences to the herring population and consequently their ecosystem role. A moderate risk of over-harvest is acknowledged by the Department's own risk assessment tool. In the absence of reliable in-season indicators, a lowered harvest rate as the starting expectation for the fishery is the only practical way to meet the conservation objective described above (1).

4. Assume there is a mechanism for persistent geographic population structure

One of the central objectives of the *Policy on New Fisheries for Forage Species* is the "maintenance of full reproductive potential of the forage species (including genetic diversity and geographic population structure, whether genetically resolvable or not)". The objective is not clearly reflected in the current management of Pacific herring. Understanding the implications of harvesting within the natural variation of spawning distribution over annual and longer time scales will not be resolved in the near future. Furthermore, a retrospective understanding of the extent of unique stocks, resident populations, and/or spawning locations is also unlikely to be easily resolved given the amount of effort already expended toward pursuing a widely held common understanding.

Management of herring must move forward with the precautionary understanding that there is at minimum semi-persistent spatial structuring of herring spawning locations. In the absence of reliable information, the most practical way of increasing the likelihood of maintaining spawning locations in the short term, is to maintain and add spatial closures but also reduce the overall harvest which by proxy will increase the likelihood of maintaining the mechanisms which contribute to the population structure. Assuming that there is some level of persistence in spawning locations based on genetic or behavioural mechanisms then the fishery should primarily target terminal spawning locations. The winter fishery may place additional risk to maintaining spawning locations as there is no way of knowing the final spawning area of these fish. In the longer term, a comprehensive approach to enable a distributed and reduced harvest across spawning locations is required.

5. Ecosystem and economy trade-offs

The herring fishery is unique in that unlike any other fishery on Canada's Pacific coast, there is a growing vocal public who recognize that there is a legitimate trade-off to consider between ecosystem and economic values. These trade off decisions are beyond the role of the IHHPC but are relevant and justified from a public resource point of view. The revised Fisheries Act enables the Minister discretion to consider "social, economic and cultural factors in the management of fisheries".

Canadian law is clear with respect to constitutional protections of First Nations, but for other end users, Canadian law and policy has no specific rules. Similar to the other aspects of implementing an ecosystem approach to herring discussed previously, there is no practical way of deciding what a moral, social and ethical end use of herring ought to be, who should benefit economically and how much economic benefit is worth the ecological trade off. Again, the best approach for these debates is to ensure that the fishery is rooted in an ecosystem approach with a greatly reduced risk profile and a long term conservation objective toward maintaining a high level of stock biomass with a broad spawning distribution.

Recommendation for 2019/20 Pacific Herring Integrated Fisheries Management Plan:

As an initial step toward a more ecosystem based fisheries management system we recommend Fisheries and Oceans Canada uses the modeled management procedure (MP) that would use a minimum escapement threshold and a harvest rate of 10% (MP#2) for setting the 2019/2020 Strait of Georgia total allowable herring catch. This harvest rate may be modified in subsequent years once a more entrenched ecosystem approach to management has been implemented and alternative harvest control rules have been decided. The recommended management procedure is consistent with the stock assessment forecast document that has acknowledged that a reduction to 10% is the most effective means of mitigating stock assessment errors.

The commercial industry and the Department do need to be recognized for their efforts for managing a conventional fishery, but as public values change, herring biology is better understood and ecological knowledge improves so must the Department's approaches to these complex issues. Management of herring requires the humility of accepting the notion that we understand less than we know, which leads to the recommendation to lower the risk profile of the fishery.

We recognize that the discussion points in this submission cannot be fully addressed for this year's IFMP and require subsequent conversations. For this year we recommend that the Department take a more precautionary harvest strategy as a step toward adopting an ecosystem approach to the fishery. We look forward to discussing these matters with you before the 2019/20 management plan is finalized.

Sincerely,

Scott Wallace, Ph.D.

Senior Research Scientist, David Suzuki Foundation
Integrated Herring Harvest Planning Committee, MCC Representative

On behalf of the Pacific Marine Conservation Caucus

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Appendix B: Table showing the proxy management procedures modeled by DFO in 2020 relative to the elements suggested by the MCC in 2019.

Element	Current	2019 MCC Suggested Element	2020 DFO modeled MCC Management Procedure
Conservation Objective	0.3 B_0	Stated that 0.3 B_0 was too low.	0.3 B_0
Biomass Objective		$SB_t \geq B_{ave}$; P≥75%	$SB_t \geq 0.6\ B_0$; P≥50%
Harvest Rate/ Operational Control Points	0.2 SB_t 0.3 SB_t	0.05-0.12, hockey stick, no operational control points suggested	0.1 SB_t, hockey stick (30-60)