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January 19, 2023
Subject: MCC response to draft 2022/2023 Integrated Fisheries Management Plan for Pacific Herring

Dear Marisa,
The Pacific Marine Conservation Caucus (MCC) is submitting this letter in response to the draft 2022/2023 Integrated Fisheries Management Plan for Pacific Herring. This letter follows our earlier submission for the draft 2022/2023 Pacific herring Food & Bait and Special Use (FB/SU) commercial fishery plans (Appendix I).

1. Strait of Georgia

We reiterate our position that the Strait of Georgia (SoG) herring are showing several signs of concern, and that these issues, when considered together, require a reduced harvest rate for 2023. As detailed in our earlier submission (Appendix I), we are specifically concerned about the following:

- Several years of sharply declining spawning biomass, with projected SB_{2023} (in the absence of fishing) representing a decline of nearly 36% from 2020 levels;
- Sharp declines in productivity for 2020 and 2021, with the 2021 productivity representing the most negative productivity estimate for SoG since these estimates became available in 1988;
- Several years of rising natural mortality to levels not seen since the late 1960s, and

- A high degree of uncertainty regarding spawning biomass estimates, and a nearly 20% probability that SB_{2023} will be below the Limit Reference Point (LRP) even in the absence of fishing.

Ultimately, we are concerned about the implications of these indicators for a potential transition toward a low productivity – low biomass (LP-LB) scenario for the SoG. These LP-LB states have emerged in recent decades for Haida Gwaii (HG), Central Coast (CC), and West Coast Vancouver Island (WCVI), and have resulted in sustained depression of those regions' herring stocks, effects for the larger ecosystem, and long-term fisheries closures. These LP-LB states are clearly the worst-case outcome for all concerned parties, and they emerge rapidly on the British Columbia coast. Again we quote DFO science (Kronlund et al., 2018), writing of the transition of HG, CC, and WCVI herring stocks into persistent LP-LB states:

"The transition into the LP-LB state was rapid, usually occurring within 3 years from relatively large spawning biomass levels and coincident with negative production values"
(Kronlund et al., 2018).

Kronlund et al. conclude that LP-LB transitions among British Columbia herring stocks typically require no more than three years. We see a warning in the several key indicators of SoG herring status that have shifted sharply over the last two years. We urge the department to see this as a key time to minimize the potential for further deterioration of SoG herring.

While herring populations are affected by a variety of non-fishery factors, the annual commercial catch rate is the tool that DFO controls. Keeping the SoG catch rate at the same level as last year's rate (10%), despite the multiple indicators of concern, will increase the likelihood of a continued downturn in the status of the stock. As is shown from Table 32 of the most recent stock assessment (DFO, 2022), the commercial SoG fisheries are already operating on a very

thin margin that has deteriorated since last year, and it will not require much more of a decline before no commercial fishing options meet the core conservation objective.

For these reasons, we again urge DFO to use the **HS30-60_HR10** management procedure for the 2023 fishery, and to employ the associated 4% harvest rate as the maximum harvest rate for the 2023 SoG herring fisheries. This harvest rate achieves DFO's core conservation objective (SB_t>0.3SB_0, with probability > 75%) across both reference and "robustness" scenarios of natural mortality, while still allowing for commercial harvest (Table 32 in DFO, 2022).

We emphasize here that **HS30-60_HR10** is the only management procedure that meets the core conservation objective across both scenarios of natural mortality (see Table 32 in DFO, 2022). The draft IFMP appears to contain a factual mistake in this regard, as the following statement appears to not be true*: "For the SOG, in the most recent evaluations which included data from 1951-2021, MPs with a 10 and 15% harvest rate met the conservation objective with the minimum 75% probability over both natural mortality scenarios."* Again, we emphasize that only **HS30-60_HR10** does this.

Furthermore, we note that lower and upper operational control points of 30% and 60% of SB_0 are put forward as the preferred management procedure for this year's fishery in Prince Rupert District (PRD), mirroring the operational control points of SoG's **HS30-60_HR10**. We also point out that PRD's SB_{2023} is estimated to be 58.8% of SB_0 in the absence of fishing, which is greater than SoG's 42.2%. A SoG harvest rate of 4%, rather than 10%, would therefore be much more aligned with the 5% harvest rate proposed for PRD.

2. Upper Stock Reference points

The MCC's position is that this species' extraordinary ecological importance warrants an ecosystem-based approach that grows and maintains the stock in a healthy zone with a high probability. As articulated in previous communications, we have considered the healthy zone as ($SBt \geq 0.6SB_0$), and high probability as ($P \geq 75\%$). From this position, we have concerns regarding DFO's proposed approach for establishing an Upper Stock Reference point (USR) for the SoG.

DFO's proposed approach to USR development is to establish stock assessment region (SAR)-specific USRs based on selected periods of apparent high productivity (**avgB prod period**). In theory, we are supportive of an approach that derives USRs from productive periods. Indeed, for CC, PRD, and WCVI, the **avgB prod period** USRs approach or exceed $0.6SB_0$ (Table 1 in DFO, 2022b). However, DFO's proposed approach for SoG is to reduce the **avgB prod period** USR by applying an apparently arbitrary multiplier of 0.8. The result is to reduce the SoG USR from $0.58SB_0$ to $0.47SB_0$, which is substantially less than the USRs for the other three assessed SARs (Table 1 in DFO, 2022b).

Reducing the difference between the USR and the LRP reduces the range of stock statuses that would trigger management adjustment of harvest rates to avoid reaching LRP status, as well as the time available for the management action to have effects. Canada's policy for the precautionary approach to fisheries explicitly requires that the USR is set sufficiently above the LRP for this reason (emphasis ours):

"For this reason, under this framework, the USR, at minimum, ***must be set at an appropriate distance above the LRP to provide sufficient opportunity for the management system to recognize a declining stock status*** *and* ***sufficient time for management actions to have effect****"* (DFO, 2009).

Thus, the reduced SoG USR is important not only because it sets a lower standard for SoG, but also because it establishes a much narrower range of conditions that will trigger management action to avoid the LRP, as well as a reduced timeframe in which the management action can be effective. We urge DFO to apply a consistent approach across SARs, and specifically, to adopt the **avgB prod period** USR for SoG, rather than the reduced **0.8* avgB prod period** version.

3. Summary

We urge DFO to recognize **HS30-60_HR10**, and its associated harvest rate of 4%, as representing the maximum allowable harvest option for 2022-2023 SoG herring. We also urge DFO to adopt a consistent **avgB prod period** approach across the four SARs that are not subject to a rebuilding plan, and to reject the use of modifiers (e.g., **0.8* avgB prod period**) that arbitrarily reduce the resulting USRs and thus shrink the range of conditions that will trigger management response for these regions.

Thank you for your time and consideration.

Sincerely,

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Integrated Herring Harvest Planning Committee, MCC Representative

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DFO. (2022b). *Management strategy evaluation update and evaluation of upper stock reference point options for Pacific herring (Clupea pallasii) in British Columbia, Canada* (Science Response). Canadian Science Advisory Secretariat.

Kronlund, R. E., Forrest, R. E., Cleary, J. S., & Grinnell, M. H. (2018). *The selection and role of limit reference points for Pacific herring (Clupea pallasii) in British Columbia, Canada* (Research Document 2018/009). Fisheries and Oceans Canada, Ecosystems and Oceans Science.

Appendix I: Recent MCC letters regarding Strait of Georgia herring fisheries

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November 16, 2022
Subject: MCC response to draft 2022/2023 Pacific Herring Food & Bait and Special Use Commercial Fishing Plans

Dear Marisa,
The Pacific Marine Conservation Caucus (MCC) is submitting this letter in response to the draft 2022/2023 Pacific herring Food & Bait and Special Use (FB/SU) commercial fishery plans. Unlike previous years, the draft 2022/2023 FB/SU plans do not include an initial amount for proposed quota allocations to these fisheries. Therefore, we will instead use this opportunity to outline our position on several key issues for the herring fisheries in the Strait of Georgia (SoG).

1. Management procedure

For several years, the MCC has advocated for the adoption of the **HS30-60_HR10** management procedure (Appendix 1). In 2021/2022, the department reduced the SoG herring harvest rate to 10%, and we were highly supportive of this decision. For 2022/2023, declining biomass and several other indicators of caution emphasize the importance of following the “hockey stick” harvest control rule associated with **HS30-60_HR10**, which requires reducing the total harvest rate to 4% for the upcoming season (Table 32 in CSAS, 2022).

Referring to the 2022/2023 stock status update (CSAS, 2022), for the SoG, spawning biomass declined by 26% between 2020 and 2022, with SB_{2022} estimated at approximately 48.9% of SB_0. We also note the high degree of uncertainty regarding SB_{2022} (5^{th} and 95^{th} percentile estimates =

41,600 and 115,208 tons, respectively. Looking ahead, SB_{2023} is projected to decline an additional 13% from 2022 levels. Natural mortality rates have sharply increased in recent years, and are currently higher than at any time since the late 1960s. Finally, for the two most recent years available (2020 and 2021), productivity sharply declined. The 2021 productivity value was negative, and represented the most negative production estimate since estimates began in 1988.

While we understand that natural fluctuations are to be expected in forage fish stock size and productivity, we are also aware that forage fish stocks can rapidly transition into persistent states of low productivity and low biomass (LP-LB), and that such transitions are characterized by brief periods of negative productivity. Here, we quote DFO science (Kronlund et al., 2018), writing of the transition of Central Coast, Haida Gwaii, and West Coast Vancouver Island herring stocks into persistent LP-LB states:

"The transition into the LP-LB state was rapid, usually occurring within 3 years from relatively large spawning biomass levels and coincident with negative production values"
(Kronlund et al., 2018).

Thus, for the 2022-2023 SoG stock, we see a need for continued caution in the face of declining biomass, rising natural mortality, and two years of sharply declining productivity, the latter of which was the most negatively-productive year since at least 1988.

For 2022-2023, we believe that **HS30-60_HR10**, and the associated 4% harvest rate, represents the maximum allowable management procedure for the Strait of Georgia. **HS30-60_HR10** is the only management procedure that achieves DFO's core conservation objective ($SB_t > 0.3SB_0$, with probability > 75%) across both reference and "robustness" scenarios of natural mortality, while still allowing for commercial harvest (CSAS, 2022). Even then, **HS30-**

60_HR10 barely achieves the conservation objective in the robustness scenario (P = 75%), underlining the need to view this management procedure as the maximum option during this period of increasing natural mortality.

Furthermore, we note that the probabilities of any management procedure achieving the core conservation objective have declined since last year. As a result, **HS30-60_HR10** for 2022/2023 has a lower probability of achieving the core conservation objective than the department's selected management procedure (minE30_HR10) had for 2021/2022. In other words, last year's selected management procedure carried lower risk than the option we are putting forward for this year. Assuming that the same degree of risk tolerance characterizes the department's decisions this year, the need to select **HS30-60_HR10** is clear. Thus, we reiterate that **HS30-60_HR10** represents the maximum allowable option for 2022-2023.

2. Population structure

We reiterate our concern regarding the winter fishery's potential to interact with the genetic diversity of SoG herring. As noted in our submission for the 2021/2022 fishery (Appendix 1), recent research of Pacific herring in Washington, British Columbia, and Alaska shows a population structured by spawn timing, and then by spatial distribution, with associated genetic differentiation (Petrou et al., 2021). Beyond its potential to yield functional benefits (e.g., through the "portfolio effect", Schindler et al., 2010), such genetic diversity is a key component of biological diversity. Canada has committed to halting and reversing biodiversity loss by 2030, lending this issue even more importance. Here, we note that the draft Haida Gwaii 'íináang | iinang Pacific Herring Rebuilding Plan presents a compelling model for how such considerations can be addressed in herring fisheries.

While the research by Petrou and colleagues spanned an area larger than the SoG, it demonstrates that differences in spawn timing and location may be associated with genetic

differentiation in Pacific herring. With contraction of the spatial extent of herring spawning in the SoG having occurred across previous decades (Figure 20 in Cleary & Grinnell, 2022), we are concerned that some differentiation may have already been lost. Going forward, we wish to address ongoing concerns that remnants of genetically distinct sub-populations may yet be present and affected by fisheries.

To this end, we are encouraged to know that the department is undertaking a pilot program to conduct genetic analyses of herring samples from at least four SoG spawning sites, selected in part for representing the extremes in herring spawn timing and location in the SoG (and thus most likely to carry associated genetic differentiation). We urge the department to devote the necessary resources to ensure that this pilot project is thorough and successful, and request that the results are made available to the public. Furthermore, we ask that the department strongly consider extending this pilot to include samples drawn from the 2022/2023 food & bait catches, to begin building a baseline of genetic information for this fishery.

3. Summary

The MCC's stated position has been that this species' extraordinary ecological importance requires an ecosystem-based approach. Two key elements of an ecosystem-based approach are to adjust our exploitation of natural systems when their productive capacities are reduced, and to manage exploitation so as to conserve biological diversity.

For SoG herring in 2022-2023, we see ample evidence of the need to reduce our exploitation in the face of rising natural mortality, declining biomass, and recent negative productivity. As such, we urge DFO to recognize **HS30-60_HR10**, and its associated harvest rate of 4%, as representing the maximum allowable harvest option for 2022-2023 SoG herring, and to adjust any quota allocated to the Food & Bait and Special Use fisheries accordingly.

To improve our shared understanding of the diversity within the SoG herring stock assessment region, we urge the department to begin building a baseline of publicly-available information regarding the genetic composition of SoG spawning sites and herring fishery catches.

Thank you for your time and consideration.

Sincerely,

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