



Joint-State Columbia River Salmon Fishery Policy Review Committee (PRC)

**Public Comments received between
October 2, 2019 and October 20, 2019**

for the November 18 meeting

8 a.m. – 5p.m.

Washington Department of Fish and Wildlife Region 5 Office
5525 S 11th St Ridgefield WA 98642

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Tuesday, October 8, 2019 3:51:57 PM

Name	Gregory Seeley
Email	lipripper2001@yahoo.com
Address	6403vNE 47th Street Vancouver Washington
Comments	<p>With your recent, but not surprising decision to allow an abundant amount of non tribal gill netting in the Lower Columbia River, when can the sports fishermen and women expect to be allowed back on the river?</p> <p>The recent and upcoming Sturgeon retention days are great and appreciated. However, letting the non tribal commercial nets back in for multiple days and not letting the sportsmen and women have an opportunity is wrong. It does nothing more than creates even more unneeded animosity between the two user groups.</p> <p>Your favorable and common sense consideration is very much appreciated and I look forward to your response.</p> <p>Sincerely,</p> <p>Gregory Seeley Vancouver, WA</p>
Attachment	

The message has been sent from 73.240.218.165 (United States) at 2019-10-08 18:51:54 on Chrome 49.0.2623.112
Entry ID: 15

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 4:27:23 PM

Name	Frank Bourn
Email	frankb@richartbuilders.com
Address	230 Blossom Way WA
Comments	I can not believe we are still hashing this out. I have fished for decades in the lower Columbia and tributaries and have voluntarily stopped fishing many rivers to protect the numbers of returning fish. Gill Netting kills indiscriminately, Fish lay in the nets unable to breath killing them before they can be released, could you imagine suffocating to death? Can you imagine a world without grandparents teaching the younger generations to fish. We all need to be responsible in not just how we harvest but how much we harvest.
Attachment	

The message has been sent from 50.76.101.21 (United States) at 2019-10-16 19:27:21 on Firefox 69.0
Entry ID: 17

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 8:05:50 PM

Name	Jay Hildebrand
Email	jahwa70@gmail.com
Address	Snohomish WA
Comments	Why are we letting greed and the interests of short-sighted individuals make decisions that will decimate the future of salmon and steelhead runs going forward. Please put a stop to this and give the fish a chance to recover. Otherwise, they will be gone from yet another river.
Attachment	

The message has been sent from 66.235.24.49 (United States) at 2019-10-16 23:05:47 on iPhone 12.1.2
Entry ID: 24

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 9:16:27 PM

Name	Bryan Irwin
Email	jbryanirwin@gmail.com
Address	Underwood WA
Comments	Keep gillnets OUT of the Columbia River. It's ridiculous the amount of money and effort spent to save ESA salmon and steelhead in the Columbia and that our fish managers (You) not only allow, but enable gillnet use. You should be ashamed.
Attachment	

The message has been sent from 71.54.207.245 (United States) at 2019-10-17 00:16:24 on iPhone 13.0.1
Entry ID: 26

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 5:54:50 PM

Name	Ryan Kilbury
Email	tomtalker@msn.com
Address	Pasco Wa
Comments	<p>Proposal for the Removal of Tribal and Commercial Gill Nets from the Columbia River: To whom it may concern:</p> <p>As a concerned angler, I realize that the 1974 U.S. v. Washington Boldt decision guaranteed Native American tribes along the Columbia River a fair share or 50% share of the harvestable fish. The state could only regulate when “reasonable and necessary for conservation.” Further, state conservation regulations could not discriminate against the tribes, using the least restrictive means necessary (Sohappy v. Smith/U.S. v. Oregon) (Belloni Decision). I am concerned that gill nets are removing certain age classes of fish. These age classes of fish are necessary for spawning escapement diversity. A diverse age class of fish, ensures that there is a diverse set of redds available for propagation. As cited in Changes in the Average Size and Average Age of Pacific Salmon, W.E. Ricker, it is becoming necessary to strive for a better way of doing things. Smaller younger age class fish dig shallower redds, while larger and older age class fish can dig much deeper redds. This leads to better overall survivability in low or high water conditions. While harvest isn’t an overall limiting factor in run return numbers, it can and does influence the age class of fish targeted. Larger specimens are being removed from the river and this is decreasing the diversity of spawning opportunities. If these practices continue, whole age classes of fish may be eliminated or severely harmed, further weakening an already challenging effort to restore these runs, including the tribes’ efforts to get 4 million salmon returning by 2020.</p> <p>I am requesting that an agreement be formed with the Commercial Fishing Industry, as well as an agreement with the Columbia River Inter-Tribal Fisheries Council to cease gill netting operations on the Columbia River beginning effective January 1, 2019.</p> <p>I would propose that any agreement guarantee a minimum of 20% fish passage of the estimated run over Bonneville dam before commercial, tribal or recreational harvest occurs. This number should be based on minimum escapement needs for hatchery production, or in the case of natural reproduction such as the Hanford Reach, 30,000 for Fall Run Chinook</p>

salmon.

As far as allocations go and how they are apportioned after the 20% guaranteed minimum of the estimated run has passed Bonneville, I would propose that the Tribes be allowed 50% of their 50% allocation initially, Sport Anglers below and above Bonneville be allowed 50% of their allocated 15% and Commercial fisherman be allowed 50% of their allocated 5%. After one of these groups meets its mid-way allocated goal, fishing should cease, and allow another 10% of the run to pass Bonneville. In run-forecasts should identify whether or not there is a trend towards more or less fish available for harvest. After that 10% has passed, fishing should continue and the parties should be allowed to continue to fish until their allocation is met. After allocations are met, and if additional fish are available for harvest or in-run estimates are updated sport anglers should be allowed to retain additional fish. It would look something like this:

Adjustments in run size estimates should be made if run size varies +/- 10% at any stop point. The figures above are approximations only.

The agreement should allow for tribal members to dip net within existing fish ladders at Corps of Engineer facilities until their prescribed quota at the prescribed stop points is necessary as indicated in the table above. Those quotas will be regulated by Tribal Fish and Wildlife Officials with accurate counting. Tribal Fish and Wildlife officials should post or provide to State Wildlife Agencies the amount of fish harvested. The Department of Wildlife should institute an on-line reporting tool to provide catch information so that stats can be kept and runs monitored continuously. Bureau of Indian Affairs IG should perform audits/investigations to insure accurate reporting.

The basis of a proposed agreement should also provide for commercial harvest by means of purse seine netting by commercial fisherman in both Washington and Oregon, subject to quotas, run size and escapement needs and the associated stop points. Those quotas will be regulated by Fish and Wildlife Officials with accurate take counts depending on run of fish, no retention of non-hatchery origin fish, with the exception of fall-run chinook.

Recreational fishing shall be limited by an assigned quota, and shall be managed with stop points (e.g 25%, 50%, 75%) to allow for more fish passage. Angers will be no longer be required to use barbless hooks. Limits will be prescribed based on predicted run size, and there should be retention of any sport fishing caught salmon, regardless of native or hatchery origin to reduce mortality. The State Department of Wildlife will institute a voluntary on-line reporting tool for anglers to provide catch information so that stats can be kept

on a continuous basis. As part of the Columbia River Endorsement Fee, monies will be put forth towards this electronic reporting system as well as an offset to Tribal and Commercial gill netters reported losses. Violators of rules will face fines, 25% which will go to Hatchery Production and Riparian Repair Efforts and 75% towards fish and game enforcement after court and any legal fees.

The intent of this agreement is to allow for reproduction of salmon and steelhead stocks, whether it be hatchery or natural origin bound. The reduction of gill nets from the Columbia River, will increase the chance of genetically diverse salmon and steelhead make it to their designated spawning areas, as well as reduce the likelihood of unintentional mortality of other game fish species.

Respectfully,
Ryan M. Kilbury

Attachment

The message has been sent from 67.158.238.126 (United States) at 2019-10-16 20:54:47 on iPhone 12.1.2
Entry ID: 21

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 6:06:36 PM

Name	Jeff Layton
Email	Jefflayton@grabflies.com
Address	Washougal WA
Comments	Stop Gill-netting on the Columbia River, a non selective fishery practice that has seen it's day. The facts like climate change are in front of our faces, to deny these changes is ignorant and irresponsible, and for what, a few coins in the pockets of holdout gill-net fishermen, who do not seen the writing on the wall of our future. We already decide against this to go backwards again for another year is so irresponsible it is mind boggling.
Attachment	

The message has been sent from 50.38.75.130 (United States) at 2019-10-16 21:06:33 on Firefox 69.0
Entry ID: 22

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 7:03:19 PM

Name	Charle Miller
Email	crbuoy@gmail.com
Address	Vancouver WA
Comments	Allowing indiscriminate gill nets back in the main stem Columbia flies in the face of science. We have these endangered and miserably low runs, such that the river is closed to sports fishers during times when catchable numbers are present and yet you are returning the nets to the main stem? Who is in your pockets? Why do you ignore how much sport fishers pay for licensing and access to the resources, let alone the economic benefit that sportsmen provide to coastal and river communities and allow the least discriminate, least economically nominally-beneficial users back in the river. Do your jobs. Represent those who pay for your agencies.
Attachment	

The message has been sent from 71.193.223.241 (United States) at 2019-10-16 22:03:17 on iPhone 13.0.1
Entry ID: 23

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 8:50:14 PM

Name	Steve Ng
Email	FishNg1@aol.com
Address	Gig Harbor WA
Comments	Just say no to gillnets please.
Attachment	

The message has been sent from 73.239.185.185 (United States) at 2019-10-16 23:50:10 on Safari 13.0.1
Entry ID: 25

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 4:16:42 PM

Name	Nello Picinich
Email	nello@ccawashington.or
Address	Vancouver WA
Comments	It is time for the status quo to change. Lets work together to save our salmon and steelhead by fully embracing selective fisheries. Please help the plight of our precious salmon and steelhead by promoting fisheries that are able to wok efficiently in mixed stock fisheries. It is time for us to accept the management failures of the past and move forward in a new, positive direction. We can no longer afford to keep the status quo.
Attachment	

The message has been sent from 173.12.160.74 (United States) at 2019-10-16 19:16:05 on Edge 18.18362
Entry ID: 16

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 4:59:56 PM

Name	Michael Smith
Email	msmithmarin@gmail.com
Address	12800 NE Salmon Crk Ave #109 Wa. 98686
Comments	<p>My message — What gives! My fishing waters are just below Bonneville. I can't fish yet Gill netters can indiscriminately take wild/non-clipped chinook & steelhead at will in the course of ripping out coho. And, again it's closed to me. I want to believe WDFW & ODFW are doing their best to balance competing interests while the whole fishery is under pressure on many fronts. BUT gill netting— it doesn't reconcile and smacks of bought & paid for political preference. That's my view and that of many bank guys I've come to know & hopefully heard</p>
Attachment	

The message has been sent from 75.100.232.147 (United States) at 2019-10-16 19:59:53 on iPhone 13.0.1
Entry ID: 19

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 4:47:04 PM

Name	brian stowell
Email	bstowell@kalama.com
Address	KALAMA WA
Comments	<p>A simple question- Why is the Columbia River the only river in the continental United States where commercial gill netting is allowed ? Once the net material penetrates the fish's gills the fish is virtually DEAD. Political lobbyists and the commercial gill netters' group are just more powerful than the sportsmen's C.C.A. etc. Money and influence seem to determine terrible realities like killing endangered fish with non-selective nets. There has to be a better way.</p>
Attachment	

The message has been sent from 216.128.101.207 (United States) at 2019-10-16 19:46:31 on Chrome 77.0.3865.120
Entry ID: 18



COASTAL CONSERVATION ASSOCIATION

October 16, 2019

SENT VIA EMAIL

Chair Carpenter, Chair Finley, Commissioners:

We are writing to outline our concerns about the Oregon-Washington Columbia River Policy Review Committee (PRC) process and our opposition to the continued efforts to abandon the bi-state Columbia River Fishery Reforms. Instead of finding consensus around a plan for improving the implementation of the bi-state reforms, the earlier actions of the PRC have created greater non-concurrency between the two states. The proposals currently under consideration threaten to plunge the management of these fisheries into extreme conflict and uncertainty for all stakeholders and come at a time when many Columbia River salmon and steelhead returns are near record lows.

Beginning with the first meeting of the PRC in January of 2019, it was clear that there was a strong bias against the bi-state Columbia River fishery reforms. Four of the six PRC commissioners were outspoken proponents of restoring mainstem commercial gillnetting. There was little surprise when the PRC voted 4-2 on February 26 to recommend restoring year-round gillnetting to the mainstem Columbia River. This extreme recommendation generated immediate public opposition and alarmed legislators in both states – at a time when both agencies had budget and Columbia River endorsement legislation pending in their respective legislatures. It was no coincidence the full Oregon Commission never brought the PRC recommendations up for a vote.

Unfortunately, the Washington Fish and Wildlife Commission was incorrectly advised by staff that it needed to make a policy decision at its March meeting in Spokane to provide guidance for the North of Falcon process for setting fall fisheries. The Spokane vote occurred just days after the PRC recommendations were adopted, with no opportunity for advance public review and comment, and took place hundreds of miles from the lower Columbia River. Members of the Washington Commission -- and subsequently the public and legislators -- were then misled that the policy decision only applied to 2019 fall fisheries. The Washington Commission's [March 4 press release](#), which a Washington State Public Disclosure Request revealed was heavily edited by PRC Chairman Donald McIsaac, led off with the following statement: *"The Washington Fish and Wildlife Commission has agreed to allow the use of gillnets during the fall salmon fishery on the lower Columbia River while state fishery managers work with their Oregon counterparts to develop a joint long-term policy for shared waters."* We now know the full ramifications of the apparent vote to adopt the PRC recommendation was to restore year-round gillnetting, which has now been cast as the "status quo" by members of the PRC.

The Washington Commission's March vote in Spokane effectively killed the legislative reauthorization of Washington's Columbia River Salmon and Steelhead Endorsement and WDFW's proposed license fee increase – costing the agency over \$17 million in the 2019-2021 biennium. The agency now faces a massive budget shortfall, continued public outcry over its policy decisions, and skeptical legislators as it asks for \$26 million in supplemental funding. This is truly unfortunate and was completely unnecessary. The future of Oregon's Columbia River endorsement, which funds a large portion of the off-channel production benefiting the gillnet fleet, hangs in the balance.

As the Commissions prepare to take additional actions on the bi-state Columbia River reforms, we urge you to consider the following:

Mainstem gillnetting is inconsistent with the primary challenges facing our mixed-stock Columbia River fisheries: 1) the conservation and recovery of wild and ESA-listed salmon and steelhead populations; and 2) the need to selectively harvest returning hatchery fish to comply with the ESA and maintain/increase hatchery production within a limited number of impacts on ESA-listed stocks.

For nearly two decades, federal and state fishery managers have reduced mainstem gillnetting due to concerns about the impact to ESA-listed salmon and steelhead populations. NOAA's 1995 draft recovery plan for ESA-listed Snake River salmon recommended mark-selective mainstem fisheries, increased hatchery production in the off-channel areas to benefit gillnet fisheries, and removing gillnets from the mainstem - by 2003! Sound familiar? We believe efforts to turn the clock back and restore mainstem gillnetting are on the wrong side of history and are inconsistent with the current and future challenges facing our salmon and steelhead.

Contrary to recent claims otherwise, mainstem non-tribal Columbia River gillnet fisheries do NOT help reduce the proportion of hatchery fish reaching wild spawning areas to help us meet federal requirements for maintaining hatchery production in compliance with wild salmon protections under the ESA.

In the lower Columbia River's mixed-stock fisheries, mainstem gillnets catch and kill the ESA-listed and wild salmon that are co-mingled with hatchery-reared salmon. As a result, they do not change the proportion of hatchery salmon on the spawning grounds (pHOS) – the key measurement under the ESA. This is often referred to as “straying.” The federal government places limits on the proportion of fin-clipped hatchery salmon that can stray onto the spawning grounds under the ESA. Compliance with these limits will only be achieved through mark-selective fisheries, the use of weirs, or further reductions in hatchery production, which comes with negative ramifications for numerous fisheries and species like orca whales that rely on salmon.

Traditional gillnets are incapable of mark-selective fishing because they kill so many of the fish that become ensnared by their gills. In nearly all gillnet fisheries the ESA-listed and wild salmon that are caught in the gillnets are harvested. Since most state fisheries are required to stay within federal limits on the number non-fin-clipped ESA-listed salmon that may be harvested or killed, the non-selectivity of gillnets can reduce the number of hatchery salmon that can be harvested within the available ESA impact limits for targeted salmon species, as well as bycatch species like Steelhead. As a result, mainstem gillnetting LIMITS our ability to maximize the selective harvest of hatchery-reared salmon within the limited ESA impacts available to non-tribal fisheries.

Rather than merely ensuring that state fisheries stay within their available ESA impact limits – the bare minimum under the law – the Commissions must focus on policies that seek to optimize the harvest of hatchery fish and the escapement of wild fish within the available ESA impact limits. Thus far, the PRC discussions have only focused on how to allocate the ESA impacts, rather than discussing how to leverage them to optimize economic and conservation objectives – including the selective harvest of hatchery fish.

The gillnet industry and their advocates have consistently worked to redefine the economic baseline and goals for the bi-state reforms.

The original bi-state reforms included a \$3.86 million average ex-vessel value baseline as a measurement of commercial economic viability and economic health – it was never intended to permanently guarantee the gillnet industry a percentage of the salmon returning to the Columbia River. However, former Oregon Commissioner Bruce Buckmaster consistently pushed ODFW staff to analyze how the gillnet fleet industry’s historical share of the harvested fish was affected by the reforms. This flawed view is akin to a catch share system for the Columbia River commercial gillnet fleet and ignores the overarching intent of the reforms, which was to provide greater certainty and optimize the overall value of Columbia River fisheries – commercial and recreational - within the limited impacts to ESA-listed fish available to manage these fisheries.

Oregon’s Senate Bill 830 directs the Oregon Commission to “optimize the overall economic benefits to this state” (Section 3a(1)(a)) and “enhance the economic viability of Oregon’s recreational and commercial and the communities that rely on these fisheries” (Section 3a(1)(b)). While SB 830 also directs the Oregon Commission to use adaptive management if the economic objectives of the reforms aren’t met, it does not support Buckmaster’s view of the economic baseline as permanent entitlement. Meanwhile, the mandate of the WDFW and the Washington Commission under RCW 77.04.012 is to “seek to maintain the economic well-being and stability of the fishing industry in the state” consistent with the conservation of fish species. Court decisions interpreting this statute do not support it being a permanent entitlement.

The PRC has spent very little time considering strategies for optimizing the overall economic value of lower Columbia River fisheries within the context of enhanced off-channel areas for commercial gillnetting, a mainstem priority for economically valuable recreational fisheries, and utilizing fishing gears capable of selective harvest – commercial and recreational – to selectively harvest returning hatchery fish. Instead, the PRC has largely focused on arbitrary discussions about impact allocations that don’t fully consider how to optimize the overall economic value of these fisheries within the available impacts.

The PRC’s earlier actions put the funding of ODFW, WDFW, and Columbia River fishery management at serious risk.

Recreational anglers in Oregon and Washington provide the largest share of the funding available to ODFW and WDFW for Columbia River fishery management, including funding for off-channel hatchery production primarily benefiting the gillnet fleet. For example, the ~175,000 Oregon anglers who purchase the Columbia River endorsement generate an estimated \$13 million in endorsement, license/tag, and federal excise tax revenue for ODFW. The Oregon Columbia River gillnet fleet generated \$223,676 in annual license, permit, commercial fish fund, and R&E surcharge revenue from 2007-2011 (Source: Fiscal Impact Statement, Measure 81). In Washington, the over 216,000 anglers who purchased the Columbia River endorsement in 2015 generated an estimated \$10.3 million in endorsement, license, and federal excise tax revenue for WDFW. This compares to approximately \$250,000 in food fish excise tax and license fees paid by the Washington Columbia River gillnet fleet.

Reversing the bi-state Columbia River reforms by returning gillnets to the mainstem will likely lead to the loss of the Oregon's Columbia River endorsement and the off-channel hatchery production it helps fund. It will also make future agency funding requests in Oregon and Washington more challenging – whether through a license fee increase or general fund requests – as legislators become increasingly concerned with agency policy decisions. This all comes against the backdrop of continued efforts by the Bonneville Power Administration (BPA) to reduce its fish and wildlife spending in the Columbia River basin, including proposals to cut off-channel “SAFE” area hatchery production. How is more controversial, non-selective mainstem gillnetting the answer to these challenges?

The implementation of selective commercial fishing gears has been crippled by agency inaction, flawed release mortality studies, and blatant double standards compared to agency management of gillnet fisheries.

On numerous occasions we have outlined how the agencies have mismanaged the implementation of purse and beach seines, including flawed release mortality studies. Instead of working to correct these errors, the agencies have instead focused on removing barriers to maintaining mainstem gillnetting – including last year's decision to reduce the steelhead release mortality rate assigned to mainstem gillnets in fall fisheries based on non-scientific observer data.

Meanwhile, the testing of pound nets in the lower Columbia River has been managed by a non-profit organization, rather than the agencies, and has been subjected to rigorous monitoring and studies to determine release mortality. Contrast this with the monitoring of traditional mainstem gillnetting, which has only been monitored six times in the past 22 years – across multiple fishing seasons most of those years. The Zones 4-5 fall gillnet fishery, which is frequently held up as being selective, has only been observed once (2017) since the Columbia River reforms were adopted in 2013.

If we are serious about the long-term sustainability of Columbia River fisheries and maintaining hatchery production, action is needed to fully transition to fishing methods capable of mark-selective harvest for mainstem fisheries – recreational and commercial. Unfortunately, we have seen little in the PRC discussions thus far to indicate that the group plans any action in this critical area.

The bi-state Columbia River reforms are the product of years of extensive work and compromise.

The Columbia River fishery reforms were formally initiated about a decade ago with the first transfers of hatchery production to the off-channel areas – primarily to offset reductions in mainstem gillnetting. Prior agreements by BPA to fund off-channel hatchery production were also predicated on the same principle: less mainstem gillnetting.

In recent years, the off-channel areas have seen significant additional increases in hatchery production as part of the reforms. The production increases have resulted in record off-channel harvests. In 2017, the off-channel gillnet fishery harvested 12,131 spring Chinook, which compared to 10,474 spring Chinook harvested by sport fisheries in the Columbia and Snake Rivers. This means that off-channel spring Chinook gillnet harvests exceeded those of hundreds of miles of recreational fisheries.

Beginning next year, the additional increases in spring Chinook hatchery production initiated as part of the Oregon Commission's March 2017 rule revisions will begin returning to the off-channel areas – enhancing both spring and summer gillnet harvests even more. Those March 2017 rule and policy changes received a unanimous vote of the Oregon Commission – including Commissioners Akenson and Buckmaster – and were billed as the compromise needed to maintain the economic viability of the gillnet fleet members. Just two years later, the members of the PRC have advocated a near complete reversal of the reforms.

The facts strongly support the implementation of the Columbia River fishery reforms, including the need for a gillnet license buyback.

There are just a handful of fishermen who are actively making a living in the Columbia River gillnet fishery - a reality that predated the reforms. In fact, from 2007-2011 only nine (10%) of the active Washington gillnet permits landed an average of more than \$20,000 in ex-vessel value. Most active fishermen (64%) landed less than \$10,000 in average annual ex-vessel value. 90% of active Washington gillnet permits landed less than \$20,000 in average annual ex-vessel value. The situation is very similar in Oregon. A coordinated, bi-state gillnet license buyback is needed to address this overcapacity and provide gillnetters who wish to retire or who do not wish to fish the off-channel areas an opportunity to leave the fishery.

On a per fish retained basis, the economic value of a salmon harvested in the recreational fishery far exceeds that of a salmon harvested in the Columbia River gillnet fishery. In fact, in recent years a fish retained in the recreational fishery has been worth about \$215 each in trip expenditures. A salmon harvested in the commercial gillnet fishery is worth about \$37 based on the ex-vessel value and WDFW's commercial multiplier.

The PRC has also heard about the unmet demand that exists for recreational fishing opportunity throughout the Columbia River basin, including for spring Chinook. Instead of considering how to optimize the management of spring Chinook to generate economic value through recreational fishing opportunity throughout the basin, the PRC has focused on efforts to restore mainstem gillnetting – despite the large gillnet harvests of spring Chinook in the off-channel areas.

In summary, we offer the following comments and concerns:

- The PRC's February recommendations were the result of the views of the Commissioners who were selected to serve on the committee and should not be considered the "status quo" for any potential changes to 2020 and beyond. Members of the Washington Commission were not given accurate information about the need for, and practical effect of, their rushed March vote in Spokane.
- Mainstem gillnetting is inconsistent with the primary challenges facing our mixed-stock Columbia River fisheries: 1) the conservation and recovery of wild and ESA-listed salmon and steelhead populations; and 2) the need to selectively harvest returning hatchery fish to comply with the ESA and maintain/increase hatchery production within a limited number of impacts on ESA-listed stocks.
- The primary purpose of the Columbia River reforms remains valid today: to improve the conservation of wild and ESA-listed salmon and steelhead through selective harvest practices and optimize the economic benefits of these fisheries within ESA constraints.

- The Columbia River reforms were never intended to forever guarantee the commercial fishing industry a percentage of salmon harvests, but to enhance the viability of the commercial and recreational fishing sectors and the communities that rely on these fisheries.
- The PRC's earlier actions have created less concurrency between Oregon and Washington and have put the funding of ODFW, WDFW, and Columbia River fishery management at serious risk.
- The implementation of selective commercial fishing gears has been crippled by agency inaction, flawed release mortality studies, and blatant double standards compared to agency management of gillnet fisheries. The Commissions must make the development of this gear a priority.
- The bi-state Columbia River reforms are the product of years of extensive work and compromise, including the March 2017 unanimous vote by the Oregon Commission adopting their current rules, which have provisions both sides oppose.
- Gillnet landings data, the differences in economic value between the commercial and recreational fishery, the enhancement of the off-channel areas, and broader demographic changes in the gillnet industry all support the continued implementation of the reforms – including a buyback program in both states.

We urge you to resist the continued efforts to abandon the Columbia River fishery reforms and instead provide the oversight necessary to ensure the reforms achieve their conservation and economic objectives.

Sincerely,



Chris Cone, Executive Director
CCA Oregon



Nello Picinich, Executive Director
CCA Washington

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Thursday, October 17, 2019 4:06:23 PM
Attachments: [WDFW Commission C3620 recomendations 9-15-19 - Approved.pdf](#)

Name	John Foltz
Email	john@snakeriverboard.org
Address	Dayton Washington
Comments	Please see the attached letter from the Snake River Salmon Recovery Board in Southeast Washington. Thank you.
Attachment	https://www.123formbuilder.com/upload_dld.php?fileid=977db83ae9bb86df3118c5269f83c0a8

The message has been sent from 64.146.188.20 (United States) at 2019-10-17 19:06:18 on Firefox 69.0
Entry ID: 32



410 B East Main
Dayton, WA 99328
phone: 509.382.4115
www.snakeriverboard.org

October 15, 2019

Dr. Bradley Smith, Chairman
Washington State Fish and Wildlife Commission
600 Capitol Way North
Olympia, WA 98501-1091

Michael Finley, Chairman
Oregon Fish and Wildlife Commission
4034 Fairview Industrial Drive SE
Salem, OR 97302

Dear Chairman Smith, Chairman Finley, and Members of the Washington and Oregon Commissions:

The Snake River Salmon Recovery Board appreciates the opportunity to comment on the spring Chinook salmon sections of the joint Oregon-Washington Columbia River Harvest Policy.

Our recommendations also seek to align the Columbia River Policy with the Pacific Salmon Treaty to ensure that fishing benefits are equal to the production of salmon and where they originate, thereby also providing consideration to conservation and habitat investments made and recognizing that we in the Snake River Recovery Region are willing to invest in conservation as long as fishing opportunities exist. We believe that these recommendations are aligned with the guiding principles of promoting the conservation and recovery of endangered species, enhancing the overall economic well-being and stability of Columbia River fisheries, and increases geographic equity of sport fishing opportunity. We also believe that these recommendations do not negatively impact the other guiding principles. Additionally, RCW 77.04.012 mandates that the commission maximize public recreational fishing and hunting **opportunities of all citizens**. As stakeholders, we have observed that the current allocation split does not provide **all citizens**, regardless of geography, equitable recreational fishing opportunities for Columbia River spring Chinook salmon.

We offer two thoughts on the Columbia River Policy:

1. Regarding conservation needs that aren't being considered, both part of harvest and not part of harvest and
2. Upriver fishing opportunity.

On the first topic, it doesn't seem that we are considering conservation measures that support both natural origin spawning and recovery along with hatchery broodstock for hatchery production beyond the minimum ESA take permit requirements. This is concerning both for meeting recovery goals (natural origin spawners, continued later run-timing shifts, decreases in fish size/fecundity) and in meeting hatchery broodstock needs and relates to our Board's desire to have fishing opportunities and also meet conservation goals. Simply, the policy goal is to maximize harvest. While superficially counterintuitive, it seems that opportunities exist to provide additional conservation and fishing opportunity by allowing some additional marked and unmarked fish upriver without compromising lower river fisheries. This could be accomplished by allowing some of the earlier

returning fish that are upriver bound to move through the system and/or decrease fishing pressure at times throughout the season. Maybe this is not feasible, but it doesn't seem to be a consideration.

On the second concern, there is recognition that lower river fisheries are being prioritized for sociopolitical reasons, but a more equitable share could be allowed upriver. In some years this simply means a greater-than-zero fishing opportunity in the Snake River. The goal of the Snake River Salmon Recovery Board for both conservation and recovery is to provide fishing opportunity. Upriver fisheries are limited or non-existent and many of our stakeholders and landowner partners don't have the opportunity to fish in their local tributaries where these fish are, or were historically, present. Allowing a minor fishery in the mainstem Snake at minimum shows good will and incentive to work with us on conservation and restoration related work that benefit the Columbia system.

Of the options that still remain on the table for the Joint-State Columbia River Fishery Policy Review Committee, we strongly support:

1. The status quo option of remaining at an 80/20% split between recreational harvest and commercial harvest of spring Chinook in the Columbia Basin, and
2. A modest increase in up-river sport fishing allocation of spring Chinook from the current 75/25% for below Bonneville and above Bonneville to 70/30%.

These recommendations align with the current policy objectives, and if implemented would benefit current conservation efforts, allow for upriver hatcheries to meet brood stock needs and increase the geographic equity and certainty of an upriver spring Chinook fishery in Zone 6 and the Snake.

Again, the stakeholders and citizens of southeastern Washington appreciate the opportunity to comment on this policy. If there are any questions please contact John Foltz at the Snake River Salmon Recovery Board office at 509-382-4115.

Sincerely,

Signed By: 
Bill Bowles, Chair, Snake River Salmon Recovery Board

Cc: Kelly Susewind, Director, Washington Department of Fish and Wildlife
Curt Melcher, Director, Oregon Department of Fish and Wildlife
Ryan Lothrop, Columbia River Policy Coordinator, Washington Department of Fish and Wildlife
Chris Kern, Deputy Administrator, Marine and Columbia River, Oregon Department of Fish and Wildlife
Casey Mitchell, Chairman, Columbia River Inter-Tribal Fish Commission

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Thursday, October 17, 2019 10:14:38 AM

Name	Kirk Harrison
Email	kharrison@rsgfp.com
Address	Kalama Wa.
Comments	<p>The original PRC committee, which is/was dominated by the obvious pro-gillnet commissioners Buckmaster, Kehoe, McIsaac, and Akenson was nothing more than an underhanded effort, playing the part of wolves in sheep's clothing, to restore gillnetting on the Columbia whenever and wherever possible. Their efforts to portray the temporary 2019 Wa. policy as the "status Quo" has ben laughable. The policy at the end of 2018 is what should be the "status quo" and was very close to the current Oregon policy. The temporary 2019 policy is almost completely out of concurrency with Oregon. They were hoping to have Oregon vote to approve the pro-gillnet policy changes before the public realized what was going on, but thankfully that didn't happen. They even went as far as to vote amongst themselves to suspend any more efforts to get a buyback program up and running, unless it was specifically request by the gillnetters themselves. Their discussions regarding increased upriver share amongst recreational fisheries and ending barbless hook requirements were just a sham in an attempt to placate recreational fishermen.</p> <p>Not only should any information, decisions, or recommendations that they came up with be totally disregarded by both state's commissions and Fish and Wildlife staffs, they should be reprimanded for their behavior and dismissed from any further activity regarding the PRC committee.</p>
Attachment	

The message has been sent from 216.128.99.42 (United States) at 2019-10-17 13:14:12 on Internet Explorer 11.0
Entry ID: 30

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Thursday, October 17, 2019 8:30:16 AM

Name	Bob Loomis
Email	b.loomis@mackslure.com
Address	Wenatchee WA
Comments	<p>I can't believe that "we", (I'm talking about you, gill netters, Tribes, recreational fisherman etc....) as stewards of our natural resources are even considering something this absolutely ludicrous. This is becoming a joke that we are actually even talking about allowing the gill nets to continue to be used on the Columbia during a time when we have so many depleted/ESA listed stocks of fish. I am absolutely against this practice of killing non-selected species as well as target species, I have nothing against the commercial fisherman but the use of Gill Nets. They need to be eliminated....all of the ridiculous "claims" and supposed "scientific" studies that have been done are staged and absolutely WRONG! Having spotters on boats, being shown what the commercials want you to see and when you have only 1/10th of the amount of people on the boats compared to the amount of boats fishing does not make a "scientific" study valid. Please eliminate the gill nets off of the Columbia River!</p>
Attachment	

The message has been sent from 65.49.142.203 (United States) at 2019-10-17 11:30:13 on Chrome 77.0.3865.120
Entry ID: 29

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Thursday, October 17, 2019 7:19:49 AM

Name	Richard Parker
Email	55richparker@gmail.com
Address	Kennewick Washington
Comments	The poor returns of Upriver Bright kings in the last few years is a direct result of gill netting. Please correct this.
Attachment	

The message has been sent from 174.216.13.90 (United States) at 2019-10-17 10:19:45 on Chrome 77.0.3865.92
Entry ID: 28

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Thursday, October 17, 2019 6:20:21 AM

Name	Dean Potter
Email	deanpotter@comcast.net
Address	Vancouver WA.
Comments	Please do what you can to protect our endangered fish by keeping gillnets out of our waters. This should be a no brainer!
Attachment	

The message has been sent from 71.237.243.134 (United States) at 2019-10-17 09:20:18 on iPad 12.1.2
Entry ID: 27

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Wednesday, October 16, 2019 5:01:35 PM

Name	Earl Salvey
Email	esalvey@gmail.com
Address	Ridgefield WA
Comments	Come on people! It is so wrong to keep putting the indiscriminate gill nets in the Columbia River. Please stop this nonsense!!
Attachment	

The message has been sent from 73.164.145.223 (United States) at 2019-10-16 20:01:30 on Firefox 69.0
Entry ID: 21

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Thursday, October 17, 2019 3:30:05 PM

Name	Matthew Smith
Email	usmyrmss@yahoo.com
Address	Vancouver WA
Comments	Would you please cease any efforts to allow non-tribal commercial salmon fishing in the Columbia River and any of its tributaries. Refocus your objectives on eliminating all non-tribal salmon fishing in the Columbia River and any of its tributaries.
Attachment	

The message has been sent from 104.238.46.32 (United States) at 2019-10-17 18:30:01 on Chrome 76.0.3809.132
Entry ID: 31

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 3:10:19 PM

Name	Jim Andrews
Email	jimeandrewsptlnd@gmail.com
Address	Portland OR
Comments	Gillnets in the Columbia is like a zombie that just will not die.
Attachment	

The message has been sent from 71.36.118.199 (United States) at 2019-10-18 18:10:16 on Chrome 77.0.3865.120
Entry ID: 54

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 12:18:11 PM

Name	Dennis Arce
Email	dennisarce385@gmail.com
Address	Welches Oregon
Comments	No more kill nets!!!!I It's Time!!!
Attachment	

The message has been sent from 204.195.4.117 (United States) at 2019-10-18 15:18:05 on Safari 13.0.1
Entry ID: 41

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 8:25:18 PM

Name	frank betrozoff
Email	fbetrozoff@gmail.com
Address	olympia wa.
Comments	dont you think its about time you stood up and said no to the gillnets the fish are disappering ,getting smaller and not enough fish to go around
Attachment	

The message has been sent from 75.172.53.209 (United States) at 2019-10-18 23:25:15 on Chrome 77.0.3865.120
Entry ID: 66

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 11:25:52 AM

Name	Thomas Brown
Email	tawb2007@hotmail.com
Address	Eugene OR
Comments	Why on earth would we want to put more stress on an already stressed fishery? Gill nets are like vacuum cleaners in that they take everything that swims by. NO to opening the Columbia River to commercial gill netting. Tom Brown
Attachment	

The message has been sent from 174.224.8.179 (United States) at 2019-10-18 14:25:49 on Chrome 77.0.3865.92
Entry ID: 36

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 5:28:40 PM

Name	Makai Brusa
Email	makaibrusa@comcast.net
Address	West Linn Oregon
Comments	Please get the gillnetters of the river permanently. There are better ways to fish. Gillnetters are killing wild fish. I do not have documents or photos. But I have an image in my head that will always be there. It was a whole bunch of Steelhead float down the lower Columbia River. It was really awful to see. All that waste. And all because they where swept up in a net and not allowed to be kept and thrown back to float belly up. We are better than this! NO MORE GILLNETTERS!!!!
Attachment	

The message has been sent from 174.224.24.81 (United States) at 2019-10-18 20:28:34 on iPhone 13.0.1
Entry ID: 61

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 4:21:04 PM

Name	Thomas Carlier
Email	tcarlier@gmail.com
Address	Beaverton Oregon
Comments	<p>As a refresher, Here are the 5 economic benefits of the sport fishing industry...</p> <ol style="list-style-type: none">1) The tackle industry: manufacture, distribution, marketing, and retail sales of fishing rods, reels, and tackle, etc.2) The marine industry: boat, motor, and electronics ... manufacture, distribution, retail, etc.3) The tourism industry: transportation, resorts, motels, restaurants, etc.4) The media industry: tv, radio, and internet 'how to' education5) The government: licenses, tags, special fees, etc. <p>Number 5 is where your salary comes from....</p>
Attachment	

The message has been sent from 50.53.48.129 (United States) at 2019-10-18 19:21:00 on Chrome 77.0.3865.90
Entry ID: 60

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 1:37:51 PM

Name	Lud Carlson
Email	ludhuntfish@yahoo.com
Address	Oregon City Oregon
Comments	No rollback, selective harvest only. Save the fish. Your job depends on this
Attachment	

The message has been sent from 172.58.45.95 (United States) at 2019-10-18 16:37:43 on Chrome 73.0.3683.90
Entry ID: 47

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 9:11:13 AM

Name	Greg Cuoio
Email	gregcuoio@comcast.net
Address	Olympia WA
Comments	I am adamantly opposed to allow gill netting in the Columbia. This is pure nonsense and stupidity.
Attachment	

The message has been sent from 73.11.221.221 (United States) at 2019-10-18 12:11:10 on Internet Explorer 11.0
Entry ID: 33

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 6:18:16 PM

Name	Greg Fair
Email	fairga14@gmail.com
Address	Newberg Oregon
Comments	Please Please keep the reforms that have been in place and promised to us sport fishermen in place. You have taken my \$10 endorsement for these reforms and have not accounted for where this money has gone.
Attachment	

The message has been sent from 67.169.197.12 (United States) at 2019-10-18 21:18:13 on Chrome 77.0.3865.120
Entry ID: 64

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 12:26:25 PM

Name	Tom Gerold
Email	twgerold@msn.com
Address	Keizer OR
Comments	Thought the sports fisherman were the majority and that the last 2 governors had put a stop to gill netting on the main stem Columbia. Just don't understand why this keeps coming up when the sports fisherman & fisherwoman contribute the majority of the money into the economy and the ODFW.
Attachment	

The message has been sent from 73.240.198.125 (United States) at 2019-10-18 15:26:22 on Safari 13.0.1
Entry ID: 42

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 2:20:03 PM

Name	Chris Giroux
Email	christopher.giroux@gmail.com
Address	West linn Or
Comments	Please DO NOT restore year-round non-selective gillnetting to the mainstem Columbia River. Low Columbia River salmon and steelhead returns have resulted in fishery closures across the Columbia River. as an avid angler and conservationist I'm appalled that oregon would consider this.
Attachment	

The message has been sent from 93.150.27.250 (Italy) at 2019-10-18 17:19:59 on iPhone 13.0.1
Entry ID: 50

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 11:11:24 AM

Name	Mitch Hopping
Email	hoppingmitch@gmail.com
Address	3171 Metolius Drive, Eugene OR 97408 OR
Comments	I urge you not to roll back the critical bi-state Columbia River fishery reforms.
Attachment	

The message has been sent from 45.37.182.174 (United States) at 2019-10-18 14:11:21 on Chrome 77.0.3865.103
Entry ID: 34

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 11:55:30 AM

Name	Robert Huber
Email	rshuber123@gmail.com
Address	Clatskanie OR
Comments	Please reconsider the use of gillnets in the Columbia river. The fish stocks have diminished to far and this archaic method is one of the problems
Attachment	

The message has been sent from 97.115.205.5 (United States) at 2019-10-18 14:55:28 on
Chrome 77.0.3865.116
Entry ID: 38

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 12:44:33 PM

Name	Randy Hackstedt
Email	randy.hackstedt@hotmail.com
Address	Lebanon Oregon
Comments	I just want to say that I don't want kill nets on the Columbia River main stem killing wild salmon and steelhead stocks. You have chance to do something so do it!
Attachment	

The message has been sent from 74.92.161.226 (United States) at 2019-10-18 15:44:29 on iPhone 13.0.1
Entry ID: 46

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 12:44:03 PM

Name	Sandra Joos
Email	joosgalefamiy@comcast.net
Address	Portland OR
Comments	As a recreational fishing family, we are writing to express our strong opposition to the Joint OR/WA Policy Review Committee's (PRC) consideration of extreme proposals to restore and increase non-selective mainstem gillnetting. We strongly disapprove of these efforts.
Attachment	

The message has been sent from 71.238.111.67 (United States) at 2019-10-18 15:44:00 on Edge 18.18362
Entry ID: 45

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 7:41:58 PM

Name	David Kay
Email	daveatu@yahoo.com
Address	Portland Oregon
Comments	I have already PAID for the original changes to be enacted and enforced, to not move forward is nothing short of theft from the sportd men and women of the state DLive up to the agreement as written!
Attachment	

The message has been sent from 76.105.176.145 (United States) at 2019-10-18 22:41:54 on Chrome 77.0.3865.116
Entry ID: 65

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 12:42:53 PM

Name	Edmund Keene
Email	keene5621@gmail.com
Address	BANKS OR 97106
Comments	With the entire Columbia river system closed to Oregon anglers it is ridiculous to even think about opening a commercial gillnet fishery. This is after a disastrous overestimate of this year's salmon run and very early closure to sport fishermen. There is no way to justify a commercial season. What in God's name are you people thinking?
Attachment	

The message has been sent from 97.120.149.47 (United States) at 2019-10-18 15:42:49 on Chrome 77.0.3865.120
Entry ID: 43

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 2:47:37 PM

Name	Tim Marl
Email	tpmarl@wavecable.com
Address	Donald Or
Comments	Every year fishing has been poorer and poorer. I have lived in Oregon for 75 years and the policy you have implement have not worked. This was the poorest salmon season I have every had. Now you think that increasing gillnetting will make fishing better? And you can't figure out why license sales are down. Maybe you should listen to the people where most of your revenue comes from. You should be ashamed of yourselves for the poor job you are doing.
Attachment	

The message has been sent from 76.14.250.247 (United States) at 2019-10-18 17:47:35 on Internet Explorer 11.0
Entry ID: 52

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 3:53:22 PM

Name	James Marquardt
Email	joemarquardt55@yahoo.com
Address	Scappoose OR
Comments	This is a tragic plan to restore year round mainstem gillnetting on the Columbia. The money coming in from sportspeople is already low and funding for our valuable resources is in further jeopardy. Listen to the people that fund the ODFW.
Attachment	

The message has been sent from 98.125.190.233 (United States) at 2019-10-18 18:53:20 on Chrome 77.0.3865.90
Entry ID: 56

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 2:28:23 PM

Name	Tracy Meskel
Email	fish.chaser@yahoo.com
Address	Gladstone OR
Comments	Please keep the nets out of the mainstem! We should not even be talking this! We need to keep the nets away from our only true wild stock of fish!! These nets kill indiscriminately ! STOP ALL GILL NETTING ON THE MAINSTEM OF THE COLUMBIA RIVER
Attachment	

The message has been sent from 98.246.135.27 (United States) at 2019-10-18 17:28:15 on iPhone 13.0.1
Entry ID: 51

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 6:01:46 PM

Name	Brad and Dwn Parr
Email	bkparr@msn.com
Address	Tualatin Oregon
Comments	<p>Stop funding ODFW on the backs of sportsmen while allowing Nets to indiscriminately destroy NATIVE and hatchery fish runs.....</p> <p>We strongly oppose proposals to abandon the bi-state Columbia River fishery reforms and return non-selective gillnets to the mainstem Columbia River. Non-selective gillnets do not belong in mixed-stock lower Columbia River fisheries where endangered salmon and steelhead are present. Gillnets are incapable of selectively harvesting hatchery fish, which is key to recovering wild salmon populations and meeting federal hatchery reform requirements to maintaining hatchery production.</p> <p>Instead of falling back on indiscriminate, industrial commercial gillnetting, our region must fully transition to fisheries capable of selective harvest - recreational and commercial - to harvest more hatchery and healthy wild stocks of salmon within the limited number of endangered salmon and steelhead that may be impacted in state fisheries. Our goal should be to get more wild salmon back to the spawning grounds, not merely the bare minimum.</p>
Attachment	

The message has been sent from 67.189.120.238 (United States) at 2019-10-18 21:01:43 on Edge 18.18362
Entry ID: 62

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 2:09:32 PM

Name	Charles Patchin
Email	chuckpatchin@yahoo.com
Address	Portland Oregon
Comments	Please keep the gill nets off the main stem Columbia River
Attachment	

The message has been sent from 50.53.96.102 (United States) at 2019-10-18 17:09:29 on iPhone 12.1.2
Entry ID: 49

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 3:15:16 PM

Name	Greg Peldyak
Email	peldyak@aol.com
Address	Hood River Oregon
Comments	Instead of non selectively letting the commercials' gill net, let them use hook and line. A wild Columbia fish goes back. An endangered Clearwater B run 20lb. steelhead gets released. The Tribes just recommended removal of three lower Columbia dams. That won't happen until we transition to renewable energy. Lets be smart about what we can really do next year and let the commercials' use hook and line. Greg Peldyak
Attachment	

The message has been sent from 47.40.111.253 (United States) at 2019-10-18 18:15:12 on Chrome 75.0.3770.144
Entry ID: 55

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 4:10:20 PM

Name	Daniel Quanbeck
Email	dan@agglass.net
Address	Salem OR
Comments	<p>I strongly oppose proposals to abandon the bi-state Columbia River fishery reforms and return non-selective gillnets to the mainstem Columbia River. Non-selective gillnets do not belong in mixed-stock lower Columbia River fisheries where endangered salmon and steelhead are present. Gillnets are incapable of selectively harvesting hatchery fish, which is key to recovering wild salmon populations and meeting federal hatchery reform requirements to maintaining hatchery production.</p> <p>Instead of falling back on indiscriminate, industrial commercial gillnetting, our region must fully transition to fisheries capable of selective harvest - recreational and commercial - to harvest more hatchery and healthy wild stocks of salmon within the limited number of endangered salmon and steelhead that may be impacted in state fisheries. Our goal should be to get more wild salmon back to the spawning grounds, not merely the bare minimum.</p> <p>The bi-state reforms are the result of significant effort and compromise, including increased hatchery production to benefit gillnet harvests in off-channel areas. Efforts to undo the reforms put this hatchery production and the funding available for Columbia River salmon management at risk. Efforts to extend Washington's Columbia River endorsement fee were recently rejected by their state legislature and Oregon's endorsement must be reauthorized next year.</p> <p>One key purpose of the bi-state reforms was to enhance the overall economic benefits of the fishery and provide more certainty for fisheries - it was never to increase gillnet industry profits.</p> <p>I urge you to reject any further efforts to abandon the Columbia River reforms and hold the agencies accountable for their implementation.</p>
Attachment	

The message has been sent from 71.238.17.57 (United States) at 2019-10-18 19:10:17 on Chrome 77.0.3865.120

Entry ID: 58

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 11:16:46 AM

Name	Joseph Reed
Email	joe.reed@comcast.net
Address	HILLSBORO OR
Comments	I am asking the Columbia PRC to stop allowing non-selective gill nets on the main stem Columbia river. As a sport angler we collectively provide the largest portion of funds to run hatcheries and fund ODFW. If the current Columbia River fall chinook sport closures continue and gill nets are allowed to harvest anything in their nets, I will cease to purchase a salmon tag and Columbia river endorsement and focus my funds elsewhere. The current management practices are outrageous.
Attachment	

The message has been sent from 96.65.216.57 (United States) at 2019-10-18 14:16:43 on Chrome 77.0.3865.120
Entry ID: 35

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 3:56:21 PM

Name	Kenneth Reed
Email	kree60@hotmail.com
Address	West Linn OR
Comments	Please do not allow the Columbia River reform agreement to be broken. Our Columbia River endorsement money's have collected and the expectation is that reform agreement will be lived up to by a parties. As a concerned sport fishermen, we all want to see more fish and more opportunities for the future. Regards.
Attachment	

The message has been sent from 71.237.174.119 (United States) at 2019-10-18 18:56:18 on iPhone 13.0.1
Entry ID: 57

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 11:54:48 AM

Name	Phillip Roberts
Email	phillip.roberts@comcast.net
Address	Milwaukie Oregon
Comments	I have been an Oregonian for my whole life and do not approve of the way that this problem has been handled. The people voted to remove the gill nets off of the river and move to a harvest method that would be more selective and still give the commercial fisherman a way to make a living. The sport fisherman have been paying extra to make this happen and now again this is being abandoned again. It needs to be implemented as was voted for by the people.
Attachment	

The message has been sent from 70.56.194.202 (United States) at 2019-10-18 14:54:46 on Chrome 77.0.3865.120
Entry ID: 37

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 3:01:59 PM

Name	Larry Sene
Email	lsene@q.com
Address	Warren OR
Comments	<p>I am a native Oregonian purchasing licenses, tags, endorsements in this state for years and years. Gillnets have no business being allowed in the Columbia River. They should have been stopped years ago and never been allowed. Any commissioner that is pro gill net should be terminated from the commission in both states. What about Idaho? What do they think about gill nets that effect the returns up their rivers? Actually I can't even believe your considering these proposals!!!</p>
Attachment	

The message has been sent from 97.120.138.196 (United States) at 2019-10-18 18:01:56 on Safari 13.0.2
Entry ID: 53

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 6:05:53 PM

Name	David Stroup
Email	trout15@hotmail.com
Address	Keizer OR
Comments	Hello, Please either end the gillnetting and use the money from the Columbia River Endorsement fee for it's intended purpose to transition away from gill nets to another type of gear; or end the fee. Right now we are all paying the Columbia River Endorsement fee and it's not paying for what it was designed for. There is no reason to pay this fee if gill netting is to be continued. David
Attachment	

The message has been sent from 73.37.86.178 (United States) at 2019-10-18 21:05:48 on Edge 18.17763
Entry ID: 63

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 4:12:36 PM

Name	Russell Sumida
Email	ras8529@frontier.com
Address	Gresham Or
Comments	To the Joint-State Columbia River Salmon Fishery PRC: It is urgent that you Remove Gill netting from the main stem of the Columbia River if we are to have salmon in our future. The SAFE areas have provided the Commercial fisheries a valuable harvest area other than the main river where their nets are non-selective in killing both hatchery and ESA wild salmon. As Sportsfisher's have used barb less hooks and can release wild salmon while the same cannot be said for Commercial harvest, this is a tragedy only you can fix. DO THE RIGHT THING!!!
Attachment	

The message has been sent from 50.39.198.158 (United States) at 2019-10-18 19:12:33 on Firefox 69.0
Entry ID: 59

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 1:49:41 PM

Name	Harold Thompson
Email	bigboattwo@msn.com
Address	Aurora CO
Comments	Please do your part to remove gillnets from all of our NW streams. Let's save the NW salmon fishery for present and future generations of sport fishers! Thanks!!!!
Attachment	

The message has been sent from 174.29.62.244 (United States) at 2019-10-18 16:49:39 on Chrome 77.0.3865.120
Entry ID: 48

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 12:07:51 PM

Name	Linh Tran
Email	tranli@hotmail.com
Address	23880 SW Rosa Road, Hillsboro Oregon
Comments	<p>I take my 7 year old son and his cousins fishing quite a bit. With the lack of fish, it's making it more difficult to catch fish so they can remain enthusiastic about fishing in the future. Kids are the future of the fishing industry and without their interest in fishing, the fish and wildlife departments are losing a major source of their funding!</p> <p>I strongly oppose proposals to abandon the bi-state Columbia River fishery reforms and return non-selective gillnets to the mainstem Columbia River. Non-selective gillnets do not belong in mixed-stock lower Columbia River fisheries where endangered salmon and steelhead are present. Gillnets are incapable of selectively harvesting hatchery fish, which is key to recovering wild salmon populations and meeting federal hatchery reform requirements to maintaining hatchery production.</p> <p>Instead of falling back on indiscriminate, industrial commercial gillnetting, our region must fully transition to fisheries capable of selective harvest - recreational and commercial - to harvest more hatchery and healthy wild stocks of salmon within the limited number of endangered salmon and steelhead that may be impacted in state fisheries. Our goal should be to get more wild salmon back to the spawning grounds, not merely the bare minimum.</p> <p>The bi-state reforms are the result of significant effort and compromise, including increased hatchery production to benefit gillnet harvests in off-channel areas. Efforts to undo the reforms put this hatchery production and the funding available for Columbia River salmon management at risk. Efforts to extend Washington's Columbia River endorsement fee were recently rejected by their state legislature and Oregon's endorsement must be reauthorized next year.</p> <p>One key purpose of the bi-state reforms was to enhance the overall economic benefits of the fishery and provide more certainty for fisheries - it was never to increase gillnet industry profits.</p>

I urge you to reject any further efforts to abandon the Columbia River reforms and hold the agencies accountable for their implementation.

Attachment

The message has been sent from 73.164.248.130 (United States) at 2019-10-18 15:07:49 on Chrome 77.0.3865.120
Entry ID: 40

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 12:43:15 PM

Name	Frank Underwood
Email	underdog59@comcast.net
Address	Pprtland Or
Comments	No more kill nets
Attachment	

The message has been sent from 24.20.154.224 (United States) at 2019-10-18 15:42:59 on iPhone unknown
Entry ID: 44

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 11:57:44 AM

Name	Paul Wenrick
Email	p48wenrick@gmail.com
Address	Rockaway Beach Oregon
Comments	Don't go backwards on gillnets. You've been collecting extra fees from sportsman to get rid of gillnets. Do the correct thing and keep gillnets off the Columbia.
Attachment	

The message has been sent from 47.25.241.155 (United States) at 2019-10-18 14:57:41 on Chrome 71.0.3578.99
Entry ID: 39

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Friday, October 18, 2019 10:54:08 PM

Name	Jay Wylie
Email	jayd.wylie@yahoo.com
Address	Salem OR
Comments	<p>I strongly oppose proposals to abandon the bi-state Columbia River fishery reforms and return non-selective gillnets to the mainstem Columbia River. Non-selective gillnets do not belong in mixed-stock lower Columbia River fisheries where endangered salmon and steelhead are present. Gillnets are incapable of selectively harvesting hatchery fish, which is key to recovering wild salmon populations and meeting federal hatchery reform requirements to maintaining hatchery production.</p> <p>Instead of falling back on indiscriminate, industrial commercial gillnetting, our region must fully transition to fisheries capable of selective harvest - recreational and commercial - to harvest more hatchery and healthy wild stocks of salmon within the limited number of endangered salmon and steelhead that may be impacted in state fisheries. Our goal should be to get more wild salmon back to the spawning grounds, not merely the bare minimum.</p> <p>The bi-state reforms are the result of significant effort and compromise, including increased hatchery production to benefit gillnet harvests in off-channel areas. Efforts to undo the reforms put this hatchery production and the funding available for Columbia River salmon management at risk. Efforts to extend Washington's Columbia River endorsement fee were recently rejected by their state legislature and Oregon's endorsement must be reauthorized next year.</p> <p>One key purpose of the bi-state reforms was to enhance the overall economic benefits of the fishery and provide more certainty for fisheries - it was never to increase gillnet industry profits.</p> <p>I urge you to reject any further efforts to abandon the Columbia River reforms and hold the agencies accountable for their implementation.</p>
Attachment	

The message has been sent from 67.42.9.127 (United States) at 2019-10-19 01:54:05 on Chrome 77.0.3865.120

Entry ID: 67

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Saturday, October 19, 2019 9:47:21 AM

Name	Raymond Buckno
Email	r.buckno@comcast.net
Address	Columbia City Or
Comments	this year was the worst year fishing the Columbia River ever ! And yet they had the nerve to talk about putting the gilnets back in ! We need more hatcheries and better management . Sport fish bring a lot of \$ into a struggling Oregon economy . what is wrong with the politicians of this state ?
Attachment	

The message has been sent from 73.25.70.237 (United States) at 2019-10-19 12:47:18 on Firefox 69.0
Entry ID: 72

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Saturday, October 19, 2019 4:02:46 PM

Name	Eric Duhamel
Email	eddubb@yahoo.com
Address	Lincoln City Oregon
Comments	Gillnets are bad for everyone.Stick to what we all agreed to.
Attachment	

The message has been sent from 68.186.5.90 (United States) at 2019-10-19 17:09:41 on Firefox 69.0
Entry ID: 74

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 12:05:39 AM

Name	Michael Genson
Email	mikegenson@toledotel.com
Address	Toledo Washington
Comments	in the wake of the lowest salmon and steelhead runs in years, with millions of dollars being spent for salmon habitat improvement, with extreme actions and measures being taken and considered (such as Snake River dams being breached) how in the name of science and conservation does allowing non selective gear, gill nets, back into the mainstream Columbia to deplete the salmon and steelhead runs so many of us are trying to save,
Attachment	

The message has been sent from 199.15.216.172 (United States) at 2019-10-19 23:09:44 on Chrome 77.0.3865.120
Entry ID: 75

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Saturday, October 19, 2019 8:29:51 AM

Name	Philip Longway
Email	phil_longway_1@comcast.net
Address	Portland OR
Comments	As a spot fisherman I gladly follow the laws that have been established so that we can preserve our fish runs. The proposal to allow gill nets to return to the mainstream of the Columbia River is driven solely by GREED!! This is the 21st century we should have figured it out by now that this is not sustainable. Please, for the future of our children and grandchildren do not let this happen. Thank you for taking the time to read my comments.
Attachment	

The message has been sent from 67.170.136.235 (United States) at 2019-10-19 11:29:49 on iPhone 13.0.1
Entry ID: 69

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Saturday, October 19, 2019 9:27:34 PM

Name	Charles Loos
Email	looscharles@gmail.com
Address	Portland OR
Comments	I oppose gillnetting on the Columbia River, especially in light of diminishing steelhead and salmon returns.
Attachment	

The message has been sent from 71.193.194.25 (United States) at 2019-10-20 00:27:31 on Firefox 69.0
Entry ID: 76

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Saturday, October 19, 2019 7:45:01 AM

Name	Jack Morby
Email	morby517@aol.com
Address	5460 SW Dolph Drive, Portland OR 97219
Comments	Please do not abandon the Columbia Rive reforms. To protect the Columbia River fSalmon and Steelhead fisheries, I urge you to continue with the Columbia River reforms as pe original agreements. Thank You for your consideration.
Attachment	

The message has been sent from 24.22.12.6 (United States) at 2019-10-19 10:44:42 on iPhone 12.1.2

Entry ID: 68

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Saturday, October 19, 2019 9:44:44 AM

Name	Chad Price
Email	chad985@hotmail.com
Address	16965 SW Marcile Lane, Beaverton 97007 Oregon
Comments	I don't believe the recommendations coming out of the bi-state work group align with the original intent of the Columbia River Reforms. Though considering the most vocal commercial fishing advocates somehow were placed on the committee, these recommendations are not surprising. Returning to management policies as if the reforms never happened is a slap in the face to Sportfishing and Conservation.
Attachment	

The message has been sent from 73.190.101.229 (United States) at 2019-10-19 12:44:42 on iPhone 12.1.2
Entry ID: 71

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Saturday, October 19, 2019 9:17:52 AM
Attachments: [Molecular_Ecology.pdf](#)

Name	Greg Spanos
Email	cnrgreg@charter.net
Address	Hood River OR
Comments	<p>I've retired to Oregon for its' iconic fishery. And am ready to move to New Zealand (with my retirement money). They laugh at us, after supplying smolts & technology to start their new fishery. And we can't keep them safe from extinction in their natural habitat!</p> <p>Personal agendas are making decisions here, NOT good science. SUSPECTED not PROVEN negative epigenetic effects of hatchery raised smolts are being used as a 'red herring' here to support personal agendas! Years of reductions of hatchery smolts, result in lower returns....duh...what do you expect???? Ocean conditions can't be the only reason.</p>
Attachment	https://www.123formbuilder.com/upload_dld.php?fileid=414c4711510795e1c4cc3a651903bee3

The message has been sent from 35.132.184.243 (United States) at 2019-10-19 12:17:47 on Firefox 69.0
Entry ID: 71

Supportive breeding boosts natural population abundance with minimal negative impacts on fitness of a wild population of Chinook salmon

MAUREEN A. HESS,* CRAIG D. RABE,† JASON L. VOGEL,‡ JEFF J. STEPHENSON,* DOUG D. NELSON† and SHAWN R. NARUM*

*Columbia River Inter-Tribal Fish Commission, Hagerman Fish Culture Experiment Station, 3059F National Fish Hatchery Road, Hagerman, ID 83332, USA, †Department of Fisheries Resources Management, Nez Perce Tribe, PO Box 1942, McCall, ID 83638, USA, ‡Department of Fisheries Resources Management, Nez Perce Tribe, PO Box 365, Lapwai, ID 83540, USA

Abstract

While supportive breeding programmes strive to minimize negative genetic impacts to populations, case studies have found evidence for reduced fitness of artificially produced individuals when they reproduce in the wild. Pedigrees of two complete generations were tracked with molecular markers to investigate differences in reproductive success (RS) of wild and hatchery-reared Chinook salmon spawning in the natural environment to address questions regarding the demographic and genetic impacts of supplementation to a natural population. Results show a demographic boost to the population from supplementation. On average, fish taken into the hatchery produced 4.7 times more adult offspring, and 1.3 times more adult grand-offspring than naturally reproducing fish. Of the wild and hatchery fish that successfully reproduced, we found no significant differences in RS between any comparisons, but hatchery-reared males typically had lower RS values than wild males. Mean relative reproductive success (RRS) for hatchery F_1 females and males was 1.11 ($P = 0.84$) and 0.89 ($P = 0.56$), respectively. RRS of hatchery-reared fish (H) that mated in the wild with either hatchery or wild-origin (W) fish was generally equivalent to $W \times W$ matings. Mean RRS of $H \times W$ and $H \times H$ matings was 1.07 ($P = 0.92$) and 0.94 ($P = 0.95$), respectively. We conclude that fish chosen for hatchery rearing did not have a detectable negative impact on the fitness of wild fish by mating with them for a single generation. Results suggest that supplementation following similar management practices (e.g. 100% local, wild-origin brood stock) can successfully boost population size with minimal impacts on the fitness of salmon in the wild.

Keywords: parentage analysis, reproductive success, salmonids, supplementation

Received 21 December 2011; revision received 17 August 2012; accepted 23 August 2012

Introduction

Artificial breeding programmes are widely used for the conservation of threatened or endangered species and for the restoration of declining populations (IUCN 1998; Frankham *et al.* 2002; Fraser 2008). Conditions associ-

ated with artificial rearing, such as the absence of predators, food availability and disease treatments, result in selective pressures that are widely different from natural environments. Artificially reared organisms are thus subject to adaptation to captivity (i.e. domestication selection; Frankham *et al.* 2002; Ford *et al.* 2008). Large-scale, human-mediated releases of plants and animals occur worldwide, and when artificially reared individuals are released to the wild, there can be negative genetic effects on native or wild populations (reviewed in Laikre *et al.* 2010). Specifically, considerable concern exists over domestication selection because

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reproductive fitness of wild populations can be reduced when artificially reared individuals mate with wild counterparts (Araki *et al.* 2009). Additionally, gene flow from these individuals into native or wild populations can homogenize genetic structure of wild populations (Eldridge *et al.* 2009) and disrupt the capacity of natural populations to adapt to changing environmental conditions (McGinnity *et al.* 2009).

Hatchery-reared Pacific salmon and steelhead (*Oncorhynchus spp.*) are commonly released into the wild environment to boost abundance of declining populations, mitigate for environmental and habitat disturbances and to enhance harvest fisheries. Salmonid hatcheries are broadly classified by having conservation or harvest objectives (reviewed in Naish *et al.* 2007). Traditional salmonid hatchery programmes with harvest objectives are designed to increase the population census size using hatchery-origin fish that are reared for multiple generations in an artificial environment, and often with out-of-basin (i.e. nonlocal) brood stock that may not be locally adapted to environmental conditions. Due to the nature of traditional hatchery programmes, fish are subject to negative genetic impacts such as inbreeding (reviewed in Wang *et al.* 2002), domestication selection (Heath *et al.* 2003; Reisenbichler *et al.* 2004; Christie *et al.* 2011) and reduced fitness due to repeated generations in captivity (Araki *et al.* 2007a). In contrast, supplementation programmes are designed to mitigate for ongoing limiting factors to survival (i.e. dams, removal of individuals in harvest fisheries, habitat degradation, etc.) with the goal of increasing natural population size for conservation and population recovery purposes, while striving to minimize the genetic impact to natural populations (Cuenco *et al.* 1993; Waples *et al.* 2007). Integrating wild-origin individuals into supplementation brood stock is one method that can be used to help offset potential negative effects on fitness (Wang & Ryman 2001; Duchesne & Bernatchez 2002; Ford 2002). Artificially produced offspring from brood stock (either hatchery or wild-origin) are subsequently released into the wild to spawn. This approach has caused some concern because the artificial environment can select for individuals that may be poorly adapted to the natural environment (Johnsson *et al.* 1996; Pearsons *et al.* 2007; Frankham 2008; Christie *et al.* 2011), and hatchery-reared fish may impose negative impacts to the fitness of wild fish (Araki *et al.* 2009).

The concern over hatchery fish spawning in the wild is supported by theoretical work that shows that even if local, wild-born fish are used for brood stock each year, domestication selection in the hatchery could lead to fitness consequences for the wild population (Lynch & O'Hely 2001; Ford 2002; Goodman 2005; Chilcote *et al.* 2011). However, additional studies demonstrate that

increasing the proportion of wild-born individuals into the captive population can slow the rate of genetic adaptation to captivity (Frankham & Loebel 1992) and reduce inbreeding in supplementation programmes (Duchesne & Bernatchez 2002). Empirical studies have shown that hatchery-reared salmonids have lower reproductive success in the wild compared with wild-origin fish in the first generation (Araki *et al.* 2007b; Williamson *et al.* 2010; Berntson *et al.* 2011; Theriault *et al.* 2011; Anderson *et al.* 2012), but few studies have investigated fitness effects over multiple generations. Two recent studies that examined fitness over two generations focused on a single population of steelhead trout (*Oncorhynchus mykiss*) and demonstrated that an increased number of generations in captivity can have negative fitness consequences on the population, but results were highly variable across years (Araki *et al.* 2007a, 2009). Fitness declines of hatchery-reared fish in the wild have been attributed to a number of causes. Hypotheses include the absence of sexual selection in the hatchery environment (stronger effect on hatchery males than females—Theriault *et al.* 2011; Anderson *et al.* 2012), the use of nonlocal origin brood stock over multiple generations (Chilcote *et al.* 1986; McLean *et al.* 2003; Araki *et al.* 2007b), differences in spawning location and age (Williamson *et al.* 2010), as well as body size, return date and the number of same-sex competitors (Berntson *et al.* 2011). Despite evidence that hatchery-reared fish can have lower reproductive success in the wild compared with their wild-origin counterparts, the potential for benefits from supplementation programmes using local-origin fish for brood stock warrants more extensive study. Specifically, when hatchery-reared fish are allowed to spawn naturally, can supportive breeding boost abundance while minimizing negative fitness impacts on wild fish?

Despite the need for this type of evaluation of supplementation programmes, all published studies evaluating reproductive success of hatchery-reared salmonids in the natural environment focus on programmes that use both wild and hatchery-reared fish as brood stock, and supplementation was initiated prior to the study of the target programme. In addition, studies have largely been focused on steelhead, which are typically reared in the hatchery to smolt within 1 year before being released as juveniles, rather than rearing to age 2 or older as typically found in nature (Araki *et al.* 2007a,b, 2009; Berntson *et al.* 2011). Recent studies are available for a few other salmonids (Berejikian *et al.* 2009, chum salmon; Williamson *et al.* 2010 and Anderson *et al.* 2012, Chinook salmon; Theriault *et al.* 2011, coho salmon), but none have estimated lifetime relative reproductive success (RRS) over multiple generations in the wild. Thus, there is a need for greater species coverage as

well as multi-generation studies that examine supportive breeding programmes from the initiation of supplementation. Further, additional studies of Chinook salmon (*Oncorhynchus tshawytscha*) in natural environments may be critical because of the extensive use of hatchery supplementation for this species and the potential for relatively high fitness of hatchery-reared fish of this species (Schroder *et al.* 2008, 2010). The available RRS studies on Chinook salmon in the wild evaluate adult to juvenile production (Williamson *et al.* 2010) and colonization of newly accessible habitat (Anderson *et al.* 2012), and no published RRS studies have evaluated the lifetime fitness (adult to adult) of this species over multiple generations.

Here, we assess the lifetime fitness of Chinook salmon in Johnson Creek, a tributary to the South Fork Salmon River (SFSR) in central Idaho, USA, by following an ongoing supplementation programme for two generations (1998–2010), beginning with the first year (1998) that wild-origin returns were taken into the hatchery and used for brood stock. We use genetic parentage assignments to test the following: (i) Does the hatchery programme provide a demographic boost to the wild population over

two generations? (ii) Are there differences in reproductive success between wild and hatchery-reared fish spawning in nature? (iii) Are there short-term (approximately two generations) genetic consequences of supplementation—that is, do hatchery-reared fish spawning in nature reduce the fitness of the wild population?

Methods

Study site and sample collection

The Salmon River basin is one of the largest subbasins of the Columbia River and covers approximately 36 000 thousand square kilometres within the Northern Rocky Mountains of central Idaho. The Interior Columbia Technical Recovery Team (ICTRT) identified three unique populations of spring/summer Chinook salmon that occur within the SFSR: the SFSR mainstem, the Secesh and the East Fork SFSR. Johnson Creek is the primary spawning aggregate of Chinook salmon within the East Fork SFSR (Fig. 1) and represents one of 32 spring/summer Chinook salmon populations listed under the Endangered Species Act in the Snake River

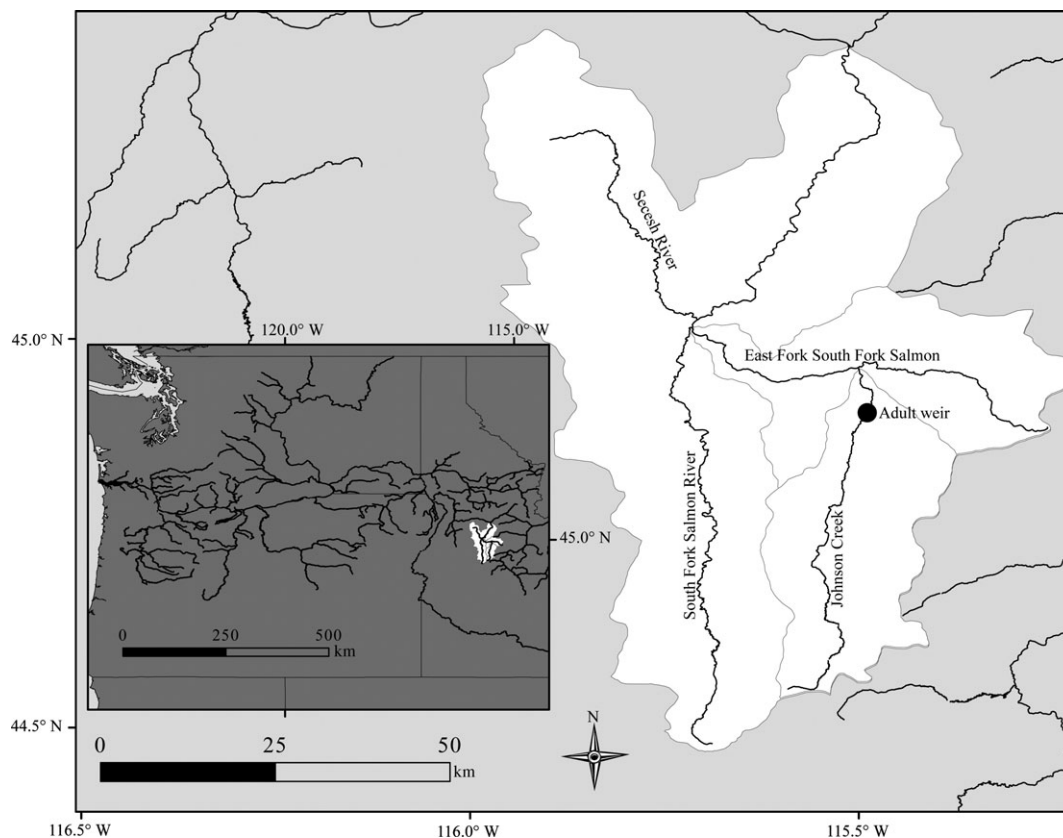


Fig. 1 Map of the study area, showing location of the weir. Inset map shows the location of the South Fork Salmon River basin highlighted in white.

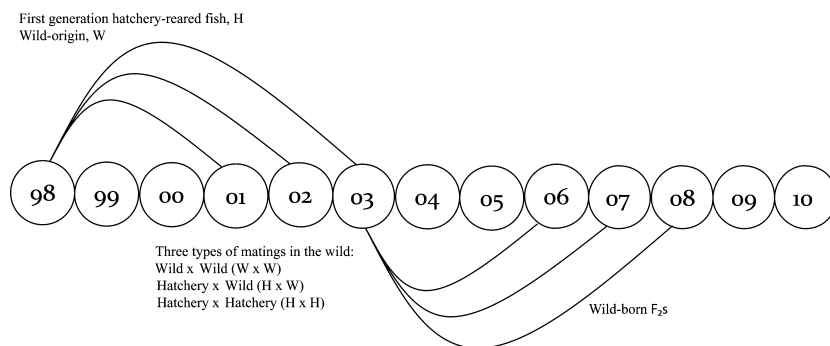


Fig. 2 Sampling design for the study. Illustrated is the sampling design for the first year of supplementation in 1998, but the same design applies to annual brood stock collections for 2000 to 2005 (5-year-olds from brood year, BY 2005 return in 2010, the last sampling year of this study). Circles represent the BY, corresponding to the year that adults return to Johnson Creek to spawn. This example shows first-generation hatchery fish (F_1) from BY 1998, which return to spawn alongside their wild-origin counterparts in 2001 (age 3, 'jacks'), 2002 (age 4) and 2003 (age 5). Mating among hatchery-reared and wild-origin fish occurred in every year beginning in 2001 to create wild-born F_{2s} , which return 3–5 years later. The example follows age 5 fish (born in 1998) that returned as adults in year 2003 and produced wild-born fish (F_{2s}) that returned in years 2006 through 2008.

Evolutionarily Significant Unit (ICTRT 2005). The putative wild Chinook salmon population aggregations in these three areas of the SFSR remain intact despite substantial releases of hatchery stock for supplementation and harvest augmentation in the SFSR mainstem (Matala *et al.* 2012). A supplementation programme was initiated in 1998 by the Nez Perce Tribe in an effort to prevent extirpation by increasing natural production of Chinook salmon in Johnson Creek.

Tissue samples and associated biological data were collected from 7726 returning adults encountered at the Johnson Creek picket-style weir, and during annual multiple-pass spawning ground surveys conducted upstream and downstream of the weir from 1998 to 2010. The weir occurs downstream of approximately 94% of the spawning habitat (Rabe & Nelson 2010). In the field, gender was determined by physical morphology, fork length was measured to the nearest centimetre, and origin was identified through the presence/absence of marks, tags or clips (hatchery fish have a coded wire tag and/or a visual implant elastomer tag; hatchery strays from other locations have adipose fins removed). If a fish had no visible mark, it was inferred to be produced in the wild. A tissue sample from the caudal fin was taken for genetic analysis, and these individuals were marked with an individually numbered operculum disk tag. Nontagged fish were sampled on multiple-pass spawning ground surveys upstream and downstream of the weir to achieve a high sampling rate over the course of the study (78–100%; annual mean = 95%). Only wild-origin (W , defined as fish born and reared in the natural environment, regardless of parentage), returning adults were selected for brood stock each year; all wild adults

not collected for brood stock and all hatchery-origin adults were released upstream of the weir to spawn naturally. The actual genetic composition of fish used for brood stock was 98% wild origin because a total of seven hatchery-reared fish over the period of 2001 through 2005 were unintentionally used as brood stock (5 fish from brood year, BY, 1998 and 2 fish from BY 2000). Hatchery smolts were released directly into Johnson Creek after rearing in a hatchery environment for 18 months. No fish were collected as brood stock in 1999 because only 22 fish returned, and all were allowed to spawn naturally.

The proportion of returns by age class to Johnson Creek varied between hatchery-reared and wild-origin fish. The majority of wild-origin fish returned at age 4 (mean, 62%), followed by age 5 (mean, 28%), and a smaller proportion returned at age 3 that were exclusively males (termed 'jacks'; mean, 10%). Most hatchery-reared fish returned to Johnson Creek at age 3 (mean, 43%, all males) and 4 (mean, 49%); with a smaller proportion that returned at age 5 (mean, 8%). Adult offspring from the first year of supplementation (BY 1998) returned to Johnson Creek at ages 3, 4 and 5 in 2001, 2002 and 2003, respectively. All returning F_1 hatchery-reared fish (H) were released upstream of the weir for natural spawning with their wild F_1 counterparts (Fig. 2). Offspring that resulted from naturally spawning F_{1s} from BY 1998 (first year of supplementation) were termed F_2 and returned to the Johnson Creek weir as adults in 2004 to 2008 (Fig. 2). The same type of sampling scheme was achieved in each return year through 2005, as the last of the offspring (5-year-olds) from BY 2005 returned in 2010. Genetic parentage analysis was used to assign wild-origin F_2 returns back to their F_1 parents.

Parentage analysis

Genomic DNA was extracted from fin tissue following manufacturer's protocols for QIAGEN DNeasy extraction kits, and individuals were genotyped using 15 microsatellite loci: *Ots100* (Nelson & Beacham 1999), *Ots3M* (Greig & Banks 1999), *Ssa408* (Cairney *et al.* 2000), *OMM1080* (Rexroad *et al.* 2001), *Ots211*, *Ots212*, *Ots213*, *Ots201b*, *Ots208b* (Greig *et al.* 2003), *OtsG474*, *Ots311* (Williamson *et al.* 2002), *Ogo2*, *Ogo4* (Olsen *et al.* 1998), *Ots9* (Banks *et al.* 1999) and *Oki100* (K. Miller, unpublished data). Markers were amplified and genotyped as described by Narum *et al.* (2010). Briefly, fluorescently labelled PCR products were separated with fragment analysis chemistry on an Applied Biosystems 3730 Genetic Analyzer and genotyped with GeneMapper software. MSeExcel Microsatellite toolkit was used to identify duplicate genotypes. Duplicates resulted from fish sampled first at the weir, and again on a redd or spawning ground survey. Use of operculum tags to mark fish at the weir minimized the occurrence of duplication to 58 individuals, and in each of these cases, only the first capture sample at the weir was included in the analysis.

To assign returning adult offspring to parent(s), we used an exclusion approach with the program CERVUS 3.0 (Marshall *et al.* 1998; Kalinowski *et al.* 2007). Individuals genotyped for at least 12 of the 15 loci were included in parentage analyses. For single-parent-offspring comparisons, only those exhibiting no mismatches at a minimum of 14 common loci were considered true parent-offspring groupings. Only one mismatching locus was allowed for trios (offspring matching two parents), with at least 12 loci in common among all three individuals. These thresholds were highly conservative to avoid false assignments, and genotyping error was estimated to be very low at <1% based on concordance of quality control tests with repeated genotyping using approximately 5% of the samples; however, this approach may not account for all potential errors in the study. Returning F_1 offspring (*W* and *H*) were assigned to parents for each BY from 1998 to 2005 (with the exception of BY 1999 hatchery-reared parents, described above). For example, F_1 offspring (*W* and *H*) from BY 1998 returned in years 2001 through 2003 (Fig. 2). Specifically, salmon returning in 2001 through 2003 were tested against biologically plausible candidate parents (i.e. BY 1998). Following our second and third objectives, respectively, F_2 offspring were assigned to F_1 parents in two ways: (i) Second-generation (F_2) offspring returning in years 2004–2010 were assigned to F_1 parents from BY 1998 and 2000 (i.e. F_2 are the grand-offspring of F_0 fish that spawned in 1998 and 2000). This allowed us to specifically follow

two initial brood years of supplementation through the second generation. (ii) Second-generation (F_2) offspring returning in 2006–2010 were assigned to F_1 parents that spawned naturally in 2003–2005. This also allowed us to follow the second-generation returns, however, targeting combined age groups in each of these F_1 brood years increased our sample size and allowed direct comparison to published literature (Araki *et al.* 2009) and allowed for evaluation of genetic impacts to wild fish when hatchery fish mate with them. These brood years were chosen because all parents and offspring were sampled during the years of our study.

We empirically evaluated parentage assignment error rate by attempting to assign offspring returning in 2001 to 2005 to parents used for brood stock in 1998 and 2000. Parentage assignment errors fall into two categories: type A and B errors (different from Type I and II statistical errors; Araki & Blouin 2005). The failure to assign a true parent when that parent is in the sample, type A error, was determined by first attempting to assign hatchery-reared offspring to parents that were used for brood stock (all hatchery-reared fish should assign to a parent). Specifically, we evaluated offspring that assigned to parent pairs (or 2 of 2 brood stock parents) because we have no way of validating the single-parent assignments from hatchery mating records. We then calculated concordance between the parentage assignment results and the mated parents indicated by hatchery records; an error was recorded if a hatchery-reared fish did not assign to a parent or if it assigned to parents that did not match hatchery mating records. Type B error, assignment to an untrue parent (occurs when the true parent is absent or when the true parent is present but failed to be assigned), was calculated by attempting to assign wild-origin fish to parents that were used for brood stock (no wild-origin fish would have brood stock parents) and attempting to assign hatchery-reared fish to parents not used for brood stock. The stringency of the parentage assignment criteria used influences type A and type B errors as described in Araki & Blouin (2005). Specifically, Araki & Blouin (2005) found that type B error in their data set for steelhead was 1.4% when no mismatches were allowed, but jumped up to 30.5% when two mismatches were allowed. Because type B error is used to calculate unbiased RRS, minimizing this error ensures the minimum bias on RRS.

Relative reproductive success

Using parentage analysis, we estimated lifetime reproductive success, that is, the number of returning adult offspring produced per adult individual. Lifetime reproductive success was estimated for F_0 fish that

produced F_1 s in the hatchery and in the wild and estimated for returning adult F_1 fish that produced adult F_2 offspring in the natural environment. Using our empirically derived type B error rate, we obtained unbiased estimates of RRS following equation 14 from Araki & Blouin (2005). RRS estimates were not corrected for effects of harvest because there is no differential harvest between hatchery and wild fish (Johnson Creek hatchery fish are not adipose marked; therefore, there is no influence of a mark selected fishery).

To address our first objective and determine whether the supplementation programme provided a demographic boost to the natural population, we compared the numbers of offspring produced by fish that were removed from the wild and taken into the hatchery intended for use as brood stock versus individuals that were allowed to spawn in the natural environment (BY 1998–2005, with exception of BY 1999; Table 1). The numbers of adult offspring produced each year (1998–2005) and the numbers of adult grand-offspring produced from BY 1998 and BY 2000 were calculated based on parentage exclusion results for both artificially and naturally spawning individuals. Not all fish taken for brood stock had the opportunity to contribute offspring to the next generation due to prespawn mortality, unsuccessful spawning or culling of eggs to prevent disease. In addition, not all individuals had complete genetic data; therefore, some parent–offspring

relationships were not possible to detect in our analyses. To take the most conservative approach, we counted all potential parents that were removed at the weir for brood stock, even if they did not have the opportunity to contribute offspring. We also counted all potential parents that were sampled regardless of the completeness of genetic data.

Our second objective was to determine whether there were differences in reproductive success between hatchery-reared and wild-origin fish spawning naturally (reproductive success of F_1 fish produced from BY 1998 and 2000). Mean reproductive success was estimated separately for males and females by age class. First-generation (F_1) offspring from BYs 1998 and 2000 returned as jacks (age 3 males) in 2001 and 2003, and F_1 males and females (ages 4 and 5) returned in 2002 through 2005 (Fig. 2). To compare reproductive success separately for jacks, males and females in each year, we calculated RRS by dividing the average reproductive success of hatchery-reared fish by the average reproductive success of wild fish of the same gender and age. RRS estimates were calculated in two ways to include (i) all F_1 potential parents and (ii) only successful F_1 parents that contributed to the next generation by producing one or more returning adult offspring. To compare reproductive success of hatchery-reared males and females, we calculated RRS by dividing the average reproductive success of hatchery-reared males by the average reproductive success of hatchery-reared females of the same age.

Finally, to assess the effect of hatchery-reared fish on the fitness of wild-origin fish, we compared the reproductive success among mating types in the wild for BY 2003 to 2005 ($H \times H$, $H \times W$, $H \times -$ vs. $W \times W$ and $W \times -$; where ‘-’ equals one unknown/unassigned parent). Age classes were combined in each return year (i.e. RS of all returns in a given year was evaluated), but comparisons were made separately for males and females in addition to an analysis of sexes combined (Table 3). If hatchery rearing reduces the fitness of wild-origin fish, we would expect the $H \times W$ mating type to produce significantly fewer returning adult offspring than the $W \times W$ mating type.

We tested statistical significance of all RRS estimates with a two-tailed permutation procedure using the comparison of means algorithm applied in PERM 1.0 (Duchesne *et al.* 2006) set at 10 000 permutations. To evaluate the power of our analysis, we used the distribution of reproductive success differences from the permutation tests to calculate the minimum difference in reproductive success that we could detect with 80% and 95% probability. Overall RRS values were estimated by weighted geometric means (by number of offspring), and corresponding P -values were calculated on the basis of Fisher’s combined probability.

Table 1 Comparison of the number of returning adult offspring (including jacks) produced by fish removed at the weir for hatchery brood stock and the number of returning adult offspring produced by fish allowed to spawn in the natural environment

Brood year	n , Brood stock	n , Natural spawners	Hatchery produced adult offspring relative to wild
1998	55	104	2.77
1999	0	22	n/a
2000	72	87	1.22
2001	147	1334	5.35
2002	96	1103	5.48
2003	79	715	8.01
2004	57	271	5.29
2005	75	123	4.70
Mean			4.69

n is the sample size for the number of wild fish removed at the weir intended for use as brood stock (even if they did not have the opportunity to contribute offspring to the next generation), and the number of wild and hatchery fish allowed to spawn in the natural environment. Both n categories represent all individuals that were sampled, regardless of the occurrence of incomplete genetic data.

Results

Parentage analysis

Combined nonexclusion probability for assignment of the first parent, second parent and parent pair was $2.30E-07$, $2.91E-10$ and $2.25E-17$, respectively (Table S1, Supporting information). Approximately 97.6% of samples (7481 of 7668; Table S2, Supporting information) were successfully genotyped at 12 or more loci and were included in parentage analysis. Of the adult offspring returning in 2001–2010 (representing BY 1998–2005), 87% on average were assigned a single parent or parental pair, with assignment success ranging from 69% in return year 2003 to 95% in 2005. Lower weir efficiencies (i.e. sampling rate of returning potential parents) in the initial years of the study (mean weir efficiency for 1998 and 2000 was 63%) likely influenced the assignment success rate. Improvements made to weir operation were accompanied by parentage assignment success rates consistently >90% beginning for fish returning in 2005 through 2010. Distribution of the number of offspring produced by fish that returned to spawn in the wild in 1998 through 2005 was highly skewed. The majority of natural spawners (both hatchery-reared and wild) produced no adult offspring, and approximately 32% of all females produced one or more returning adult offspring (Fig. S1, Supporting information). Only 16% of hatchery males produced adult

offspring compared with 25% of wild males (mean for 1998 through 2005). The number of hatchery-reared and wild-origin F_1 counterparts (born in 1998 and 2000) that returned and successfully reproduced in years 2001 through 2005 is shown in Table 2, and the number of F_2 fish that hatched in the wild in BYs 2003 to 2005 is shown in Table 3.

No offspring were compatible with more than one set of parents. There were 36 (0.9% of parentage assignments) offspring that assigned to a single parent in 1 year (with zero mismatches) and assigned to a parental pair in a different year. In these few cases, the assignment to two parents was accepted given the lower value of the combined nonexclusion probability of parent pairs compared with single-parent assignments. Approximately 5% of the parentage assignments were not logically possible, the majority of which occurred in the first supplementation year, 1998. In the cases where 'wild' offspring assigned to parent pairs that were mated in the hatchery, these offspring ($n = 97$, 80% were from BY 1998) were treated as hatchery-reared in subsequent RRS analyses because their hatchery mark was likely not observed during field sampling. A total of 125 offspring were not counted in RRS estimates. Specifically, 56 'wild' offspring assigned to a brood stock parent and a naturally spawning parent, 63 'wild' offspring assigned to a single brood stock parent, and 6 'hatchery' offspring assigned to parents

Table 2 Relative reproductive success (RRS) of successful (produced at least one returning adult offspring) female, male and jack F_1 fish from brood year (BY) 1998 and 2000

Return year	n F1 (H/W)	RS Hatchery	Variance hatchery	RS Wild	Variance wild	RRS*	<i>P</i> -value	80%/95% Power†	Age of returns
Females (4- & 5-year-old)									
2002	29/13	1.21	0.31	1.23	0.19	0.98	1.00	0.84/0.75	4 year from BY 1998
2003	20/43	1.25	0.20	1.30	0.41	0.96	0.83	0.85/0.76	5 year from BY 1998
2004	32/32	3.19	3.64	2.63	4.50	1.22	0.30	1.24/1.36	4 year from BY 2000
2005	8/3	4.25	1.07	5.00	9.00	0.85	0.55	0.85/0.58	5 year from BY 2000
Overall female‡						1.11	0.84		
Males (4- & 5-year-old)									
2002	24/32	1.21	0.26	1.25	0.39	0.97	0.83	0.85/0.74	4 year from BY 1998
2003	6/28	1.67	0.67	1.36	0.61	1.23	0.39	1.37/1.53	5 year from BY 1998
2004	26/36	2.54	4.34	3.17	4.43	0.80	0.27	0.78/0.66	4 year from BY 2000
2005	0/0	—	—	—	—	—	—	—	5 year from BY 2000
Overall male						0.89	0.56		
Jacks (3-year-old)									
2001	10/0	1.10	0.10	—	—	—	—	—	3 year from BY 1998
2003	15/8	1.20	0.31	1.75	1.07	0.68	0.16	0.88/0.66	3 year from BY 2000
Overall jack						—	—		

n is the sample size for number of naturally spawning successful (produced one or more returning adult offspring) hatchery-reared and wild F_1 fish from BY 1998 and BY 2000.

*RRS is calculated as the RS of hatchery-reared fish over the RS of wild-origin fish, and associated *P*-values are based on two-tailed permutation tests. Overall RRS was estimated using weighted geometric means, and the according *P*-values were calculated.

†Statistical power is the RRS value that would be significant with 80% and 95% probability.

‡Overall RRS estimate for females does not include return year 2005 due to low sample size.

Table 3 Relative reproductive success (RRS) of naturally spawning F₁ parents by mating type

Return year	<i>n</i> F ₂ offspring assigned	RRS*	<i>P</i> -value	80%/95% Power†
<i>H</i> × <i>H</i> vs. <i>W</i> × <i>W</i>				
Females				
2003	4/62	0.87	0.83	0.87/0.43
2004	40/79	0.76	0.17	0.76/0.67
2005	30/22	1.14	0.67	1.36/1.55
Overall female		0.87	0.58	
Males				
2003	4/62	1.03	1.00	1.31/1.58
2004	40/79	0.94	0.76	0.77/0.67
2005	30/22	1.02	1.00	1.50/1.74
Overall male		0.98	1.00	
Overall both sexes		0.94	0.95	
<i>H</i> × <i>W</i> vs. <i>W</i> × <i>W</i>				
Females				
2003	41/62	1.05	0.68	1.13/1.18
2004	108/79	1.12	0.48	1.21/1.32
2005	68/22	1.30	0.33	1.35/1.49
Overall female		1.14	0.62	
Males				
2003	41/62	0.96	0.85	0.88/0.80
2004	108/79	1.08	0.67	1.21/1.31
2005	68/22	0.93	0.83	0.69/0.51
Overall male		1.00	0.96	
Overall both sexes		1.07	0.92	
<i>H</i> × – vs. <i>W</i> × –				
Females				
2003	4/10	0.90	1.00	0.78/0.78
2004	5/15	0.72	0.77	0.63/0.41
2005	6/7	0.85	1.00	0.86/0.57
Overall female		0.82	1.00	
Males				
2003	1/4	—	—	—
2004	5/9	1.31	0.65	1.44/1.67
2005	2/8	0.75	1.00	0.75/0.75
Overall male		1.06	0.93	
Overall both sexes		0.91	1.00	

n is the sample size for the number of wild-born F₂ offspring that assigned to each parental mating type.

*RRS is calculated as the RS of hatchery-reared fish over the RS of wild-origin fish, and associated *P*-values are based on two-tailed permutation tests. Overall RRS was estimated using weighted geometric means, and the according *P*-values were calculated on the basis of Fisher's combined probability.

†Statistical power is the RRS value that would be significant with 80% and 95% probability.

that were not used for brood stock. A small opportunity exists for spawning downstream of the weir, and these particular types of matings (brood stock × natural spawner) may have occurred in low numbers before one parent was taken into the hatchery. For example,

there were 20 'wild' offspring from BY 1998 that assigned to two parents, where one parent was removed at the weir for brood stock, and the other parent was a natural spawner. These 20 offspring had one male parent in common that mated with multiple females (not used for brood stock). The male parent in this case successfully mated downstream of the weir before being captured for brood stock. These instances were not included in error estimates, and likewise these particular offspring were not included in RRS estimates.

For the empirical evaluation of parentage assignment errors, we found that all hatchery-reared offspring (identified via coded wire tags and/or visual implant elastomer tags) were assigned to parents that were used as brood stock, but 3.5% did not assign to the known mated parent pairs indicated by hatchery records (type A error). Inaccurate hatchery records cannot be distinguished from parentage errors and were therefore included in error estimates. Assignment of offspring to an untrue parent(s) resulted in overall 2.0% type B error (78 of 3933 offspring assigned to untrue parents). Specifically, 3.0% of hatchery-reared offspring assigned to one parent not used for brood stock, and 1.6% of wild-origin offspring assigned to one parent used for brood stock. Type B errors were confined to single-parent assignments only, as there were no trios.

Relative reproductive success

Demographic boost from hatchery-reared fish?

The numbers of returning adult offspring produced by fish removed for brood stock compared with their naturally spawning counterparts were variable each year. A range of 1.22 (BY 2000) to 8.01 (BY 2003) times as many returning adult offspring were produced in the hatchery compared with in the wild (Table 1). Averaged across all seven brood years, fish removed for brood stock produced 4.69 times more returning adult offspring (average for BY 1998 and BY 2000: 2.00) and 1.32 times as many returning adult grand-offspring on average for two brood years (BY 1998: 1.37; and 2000: 1.28) compared with their naturally spawning counterparts. Even though survival advantages of the hatchery environment were no longer present in the second generation (as these fish produced offspring in the wild environment), the demographic boost provided by the hatchery from BY 1998 and BY 2000 continued in the second generation.

Differences in hatchery-reared versus wild-origin reproductive success?

Estimates of RRS for hatchery-reared and wild-origin naturally spawning F₁ offspring (from BYs 1998 and 2000) are shown separately for jacks, males and females

by age class in Table S3 (Supporting information, for all potential parents) and Table 2 (for successful spawners only). For hatchery-reared F_1 females, mean RRS = 1.00 ($P = 0.19$), and none of the comparisons were significantly different from 1.0 (Table S3, Supporting information). For hatchery-reared adult males, mean RRS = 0.64 ($P < 0.01$) and was significantly lower in 2002 and for the 3 years combined (Table S3, Supporting information). Only one jack year was compared because wild-origin jacks that returned in 2001 did not produce any adult offspring. Unbiased RRS for hatchery-reared jacks in 2003 was 0.32 and was significantly lower ($P < 0.01$) than wild-origin counterparts (Table S3, Supporting information). The age 5 offspring from BY 2000 were not included in overall RRS estimates due to small sample size (0 males and only 12 females returned in 2005). Hatchery-reared male to hatchery-reared female RRS was 0.54 ($P = 0.03$, age 4 from BY 1998) in 2002, 1.21 ($P = 0.77$, age 5 from BY 1998) and 0.60 ($P = 0.03$, age 4 from BY 2000) in 2004.

In F_1 return years 2002–2004 (from BY 1998 and BY 2000), 40% of wild males and 31% of hatchery-reared males produced at least one adult offspring; 45% of wild females and 41% of hatchery-reared females produced at least one adult offspring (Table S4, Supporting information). Of the wild and hatchery fish that successfully reproduced (i.e. one or more adult offspring), RRS estimates were very similar and not statistically significant between any comparisons (Table 2; Fig. 3). For hatchery-reared F_1 females, unbiased RRS ranged from 0.96 ($P = 0.83$) to 1.22 ($P = 0.30$), and mean RRS = 1.11 ($P = 0.84$). For hatchery-reared F_1 males, unbiased RRS ranged from 0.80 ($P = 0.27$) to 1.23 ($P = 0.39$), and mean RRS = 0.89 ($P = 0.56$). Unbiased RRS for hatchery-reared jacks in 2003 was 0.68, but was not significantly lower ($P = 0.16$) than wild-origin counterparts (Table 2; Fig. 3).

Hatchery impacts to fitness of wild fish?

Comparisons of reproductive success for naturally spawning F_1 fish by mating type ($H \times H$, $H \times W$, $H \times -$ vs. $W \times W$ and $W \times -$) are shown separately for males and females in Table 3 (reproductive success and variance estimates are shown in Table S5, Supporting information). Compared with the fitness of mating by two wild-origin parents ($W \times W$), the mating by two hatchery-reared parents ($H \times H$) and one hatchery-reared and one wild-origin ($H \times W$) parent averaged 94.3% and 107.0%, respectively, for both sexes combined and was not significantly different from 1.0 in any comparison (Table 3; Fig. 4). Although RRS point estimates varied among years for both males and females, they were not significantly different from 1.0 in any comparison (Table 3). Four offspring assigned to $H \times H$ matings in

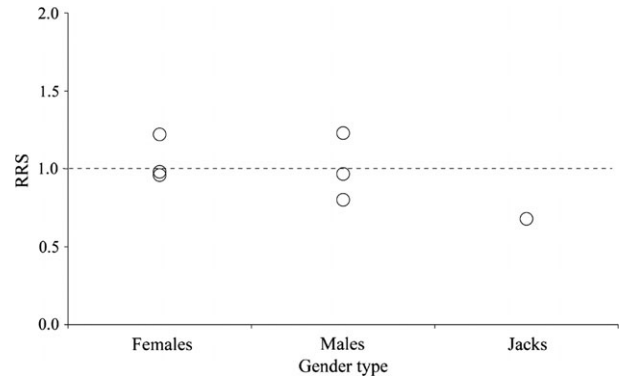


Fig. 3 Relative reproductive success (RRS) of successful F_1 spawners that produced one or more adult offspring (from BY 1998 and 2000), hatchery-reared relative to wild-origin fish for each gender type. Each point represents the estimate of RRS for each year compared and used to quantify overall RRS estimates; 2002–2004 (see associated Table 2). The dotted line (RRS = 1.0) represents where reproductive success of hatchery-reared fish is equal to that of wild-origin fish. Jacks are 3-year-old males.

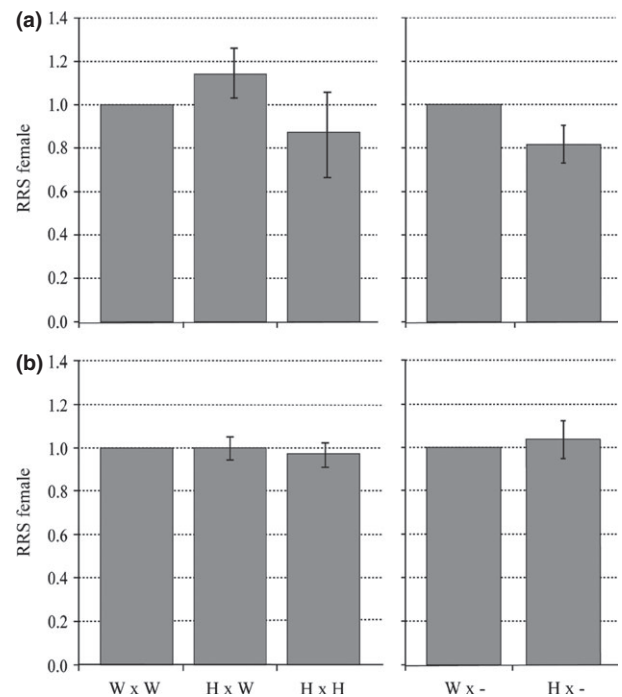


Fig. 4 Relative reproductive success (RRS) of each F_1 mating type in the wild, relative to $W \times W$ or $W \times -$ (RRS = 1.0, by definition). '-' equals unknown/unassigned parent. (a) Female F_1 s, (b) male F_1 s. Weighted geometric mean RRS among return years 2003–2005 is plotted for $H \times W$ and $H \times H$ relative to $W \times W$ on the left panels, and for $H \times -$ relative to $W \times -$ on the right panels. Error bar represents 1 SD.

2003, and RRS of $H \times H$ females relative to $W \times W$ females was 0.87. The small sample size for $H \times H$ matings in 2003 was due to few F_1 hatchery females return-

ing that year relative to wild, because most of the hatchery females produced in 1998 largely returned as 4-year-olds (65%) in 2002. Table S3 (Supporting information) shows the breakdown of sample sizes by age and sex for fish returning from the two initial supplementation years. Specifically, in return year 2003, there were almost twice as many wild 5-year-old females returning from BY 1998 compared with 5-year-old hatchery females (which largely returned as 4-year-olds in 2002). Removing year 2003 (due to small sample size) in overall estimates of RRS for $H \times H$ vs. $W \times W$ comparisons for males and females revealed similar results to those reported in Table 3 (females: RRS = 0.86, $P = 0.36$, males: RRS = 0.96, $P = 0.97$). Despite small sample sizes for single-parent assignments, comparisons over all years for both sexes ($H \times -$ vs. $W \times -$) yielded similar results where $H \times -$ produced offspring at 90.5% of $W \times -$, which was also not significantly different from 1.0 (Table 3; Fig. 4).

Discussion

The primary goals of the supplementation programme appear to have been met by providing a demographic boost to the wild population without significantly reducing fitness during the initial two generations of supportive breeding. Hatchery rearing of wild fish resulted in more wild-born adults in the next two generations than if fish had been left to spawn in nature, presumably due to survival advantages conferred by hatchery rearing. We generally fail to reject the null hypothesis that reproductive success of hatchery-reared fish is equal to that of wild-origin fish. The exception of significantly low values of RRS in BYs 2002 and 2003 was driven by hatchery males that did not reproduce, and thus had no effect on fitness of the wild population. Our results show that the reproductive success of successful hatchery-reared parents was not significantly different from wild and that mating types involving hatchery-reared parent(s) ($H \times H$, $H \times W$; or $H \times -$) were not significantly different from mating by wild-origin parent(s) ($W \times W$; or $W \times -$). Thus, evidence does not support that Chinook salmon reared for a single generation in the hatchery had negative fitness effects on wild-origin fish in Johnson Creek.

Further investigation into significantly low reproductive success of hatchery-reared males compared with wild males in 2 years revealed that this result was largely driven by individuals that produced no offspring: (i) 3-year-old males (jacks) from BY 2000 and (ii) 4-year-old males from the first supplementation year, BY 1998. Low reproductive success of hatchery-reared jacks compared with their wild-origin jack counterparts may be due to differences in rearing conditions, such as

increased growth opportunities in the hatchery environment. The incidence of early maturation in hatchery Chinook salmon is higher than in the wild (Larsen *et al.* 2004), as is the case in Johnson Creek. Hatchery-reared jacks from BY 2000 comprised 41% of the F_1 hatchery returns, whereas wild-origin jacks comprised only 13% of F_1 wild returns from BY 2000. In general, jacks are at a disadvantage for breeding success compared with large males that have better access to mating with females (Foote *et al.* 1997; Berejikian *et al.* 2010), and the higher incidence of jacks produced in the hatchery may further impact reproductive success compared with their wild-origin jack counterparts. Despite the higher incidence of jacks among hatchery returns, there is no evidence of a shift in age at return for the natural population over time (data not shown). The consequences, if any, of the hatchery jacks on the long-term viability of the natural population will be evaluated in the future.

The lowest values of RRS were observed for age 4 hatchery returns in 2002 (from BY 1998) for both males and females. This result was only statistically significant for males, but RRS estimates were below one for females returning from the first year of supplementation, and power to detect significant differences in these comparisons was low. This result is consistent with Araki *et al.* (2007b), who found that hatchery-reared fish did slightly worse in the first major return year of supplementation. However, the comparisons for females returning in 2004 and 2005 (representing the second year of supplementation, BY 2000) showed RRS estimates >1 . High annual variation in RRS of hatchery-origin fish is common in these types of studies (Araki *et al.* 2009), and additional annual comparisons will be needed to better understand the effect of hatchery rearing on the fitness of hatchery females in Johnson Creek.

Many hatchery-reared fish that returned to spawn in 2002 (from BY 1998, age 4) did not produce offspring, and this may be due to density-dependent effects and sexual selection. Return year 2002 had >1000 returning adults, making it the third highest return of Chinook salmon to Johnson Creek, behind only 2001 and 2010. Fleming & Gross (1993) observed hatchery-reared fish to be at a reproductive disadvantage compared with wild fish under high densities, with this effect especially pronounced in males. Density may also have had an effect in 2001 and 2010, but we could only compare the age 3 component (jacks) in 2001 because the eight natural jacks did not produce returning offspring, and in 2010 will not be evaluated until offspring return in 2013 through 2015. Density effects on fitness may result from hatchery-reared males showing less aggression compared with wild males when competing for access to spawning females (Fleming *et al.* 1996; Pearsons *et al.* 2007), possibly an outcome of relaxed selection in the

hatchery environment (Theriault *et al.* 2011). Indeed, two studies on the reproductive success of Chinook salmon also showed a stronger effect of hatchery rearing on males than on females (Williamson *et al.* 2010; Anderson *et al.* 2012).

Our study may provide additional support of relaxed selection in the hatchery as a mechanism for reduced reproductive success. Similar to Theriault *et al.* (2011), we found that F_1 hatchery-reared males had significantly reduced fitness compared with hatchery-reared females, suggesting a role for sexual selection. The reduction in fitness for males may be attributable to the artificial mating of competitively less fit males (e.g. less aggressive) that may not have otherwise successfully reproduced in the wild. In addition, the reduced reproductive success of hatchery males in 2 years may also be influenced by environmental effects in the hatchery.

Reproduction in the natural environment allows an opportunity for selection to act, providing a fitness advantage to individuals that are best suited to the local environment. Although genetic adaptation to captivity can occur rapidly (e.g. Christie *et al.* 2011), it is important to recognize that selection also acts in the natural environment when hatchery-reared fish return to spawn, where only a portion successfully contributes offspring to the next generation. These are the individuals that have the potential to directly impact fitness of the wild population, but we found no evidence of a negative fitness effect on wild fish when hatchery fish mated with them, and this was consistent for both males and females. Reproductive success of $H \times H$ pairings compared with $W \times W$ pairings for 2 of the 3 compared years resulted in RRS <1.0 for females and lower RRS for $H \times -$ females relative to $W \times -$ females in all three comparisons. Possible concern is warranted with regard to the RS of $H \times H$ pairings, as they may not produce as many returning adult offspring as $W \times W$ or $W \times H$ pairings.

We found no significant reduction in fitness of the hatchery fish that were successful during reproduction and more importantly, and we found no reduction in the fitness of wild fish when they mated with hatchery fish—a result that is novel compared with other published RRS studies. Araki *et al.* (2007b) found that first-generation hatchery fish (from a traditional hatchery) were reproductively less fit than wild fish and that second-generation wild-born fish produced from two hatchery parents had even lower reproductive fitness, suggesting a carry-over effect of artificial rearing that inflicted negative fitness impacts to wild fish (Araki *et al.* 2009). The lack of prior history of hatchery influence in our system, as evidenced by a lack of hatchery influence detected in Johnson Creek and the Secesh River (un-supplemented) compared with the heavily supplemented upper mainstem of the SFSR (Matala *et al.* 2012), may be an impor-

tant difference between the hatchery programme evaluated in our study and the systems that have been evaluated in other studies. Domestication impacts from nearby hatchery releases are possible despite the effort to exclude hatchery strays from Johnson Creek; however, those impacts are greatly reduced compared with other systems that are the topic of published RRS studies. Minimal prior hatchery influence in Johnson Creek further increases the potential to detect significant differences in RS between hatchery and wild fish, yet evidence for differences was limited to males that did not produce any offspring. In addition, domestication impacts are further reduced due to the nature of the Johnson Creek supplementation programme as the genetic composition of brood stock represents wild-origin fish that experience their entire life cycle in the natural environment. Minimal domestication impacts in Johnson Creek may help to explain why we did not find that hatchery fish reduced the fitness of wild fish. For example, steelhead in the Hood River system (Araki *et al.* 2007b, 2009) had a history of out-of-basin hatchery influence prior to initiation of their RRS study, and hatchery fish were incorporated into brood stock each year. Similarly, programmes that were the subject of the RRS studies by Williamson *et al.* (2010), Berntson *et al.* (2011) and Theriault *et al.* (2011) also involve hatchery programmes that use brood stock comprised in large part (up to 70–80%) by hatchery-reared fish each year. Indeed, even a few generations of domestication can have negative effects on natural reproduction in the wild (Araki *et al.* 2007a; Christie *et al.* 2011). These empirical studies indicate that use of primarily hatchery-origin fish in brood stock may result in poor performance in the wild (more generations of domestication selection) and may translate to reductions in fitness of wild fish when hatchery-reared fish mate with them.

Our study does not directly estimate genetic versus environmental components of differences between hatchery-reared and wild-origin fish (F_1 s experienced different rearing environments), which would allow us to determine whether there is a carry-over effect of artificial rearing (as found in analysis of F_2 RRS by Araki *et al.* 2009). However, based on our results thus far, it would be unexpected to see a fitness decline between the F_1 and F_2 generations because the F_2 generation is an additional generation removed from potential domestication effects, and we did not observe fitness declines of wild fish in the F_1 generation when they mated with hatchery-reared fish. We recognize that even though only wild-origin fish are used as brood stock each year, the effects of hatchery rearing may inflict small changes in fitness that may not result in significant differences in one generation, but the possibility exists for changes to accumulate over time. The effect of supplementation on the natural popula-

tion over greater than two generations will be evaluated in future years.

Our power to detect significant differences in reproductive success between hatchery-reared and wild-origin fish varied annually and is comparable to published studies where, in some years, a 50% or greater reduction in hatchery-reared reproductive success would be needed to detect a significant difference from wild-origin reproductive success (Araki *et al.* 2007a,b; Theriault *et al.* 2011). Despite some single years with reduced power, combining probabilities across multiple data sets (years) for both single-sex and mating type comparisons did not yield significant results (with the exception of males described above). Further, removal of years with low sample size had no appreciable effect on RRS comparisons. Overall, our study represents one of the most thorough data sets from a wild population to evaluate relative fitness of a supportive breeding programme. This is evident from the number of years (13) included to represent a multiple generation pedigree of spawning adults, number of fish genotyped (7481), number of microsatellite loci (15) and proportion of offspring that were able to be assigned to parents (87%). These numbers compare favourably to other studies of RRS (Araki *et al.* 2007a,b, 2009; Williamson *et al.* 2010; Berntson *et al.* 2011; Theriault *et al.* 2011; Anderson *et al.* 2012).

A variety of management protocols and strategies exist among Pacific salmonid hatchery programmes (Naish *et al.* 2007; Paquet *et al.* 2011), and each species represents multiple genetic lineages and life history traits (Waples *et al.* 2001). Given such diversity, from relatively few and isolated RRS studies conducted so far, it would be premature to generalize that all hatchery-reared fish are significant drivers of fitness declines in wild populations. Specifically, perhaps steelhead, which have been the focus of many RRS studies, are simply more prone to reduced fitness due to hatchery rearing practices. In hatcheries, prior to release in the wild, steelhead juveniles are reared for 1 year until smoltification, a physiological process that prepares fish for transition from freshwater to saltwater. The accelerated smoltification process in the hatchery deviates from the typical 2-year time frame to smolt in nature. Alternatively, Chinook salmon are reared in hatcheries for a time frame more similar to their natal juvenile rearing time of 1 year. Populations experiencing a captive environment that is most similar to what is experienced in the natural environment may show the least divergence from the original wild population (Shuster *et al.* 2005), and risks of genetic adaptation to artificial environments are reduced with fewer numbers of generations in captivity (reviewed in Williams & Hoffman 2009). Nevertheless, our results place into question the

generalization that all hatchery fish are significant drivers for fitness declines by demonstrating that supplementation programmes, under certain management practices (e.g. using local wild-origin brood stock, minimal time spent in captivity), can successfully boost population size with minimal negative impacts to the fitness of Chinook salmon in the wild.

In the face of environmental perturbations, fishery harvest and habitat alterations, the ability for anadromous salmonids at risk of extinction to recover to sustainable levels is uncertain. Supportive breeding is simply one of the many tools needed to re-build depressed populations and maintain abundance. In addition to salmonids, many species are incapable of sustaining themselves predominately due to human impacts, and the need to take individuals into a captive environment for long-term survival is a reality for many threatened and endangered species. A goal for captive programmes is to limit deleterious genetic changes during captivity, so that the long-term viability of a population in the wild environment is maximized. One way to minimize the effects of adaptation to captivity, and perhaps subsequent negative impacts on wild populations, is to incorporate some portion of wild genes into the captive population each year. Our study highlights the value in using wild individuals adapted to local environmental conditions for supportive breeding.

Acknowledgements

We appreciate the efforts and dedicated work of field crews from the Nez Perce Tribe Department of Fisheries Resources Management who conducted multiple years of on-site genetic sampling. We are grateful for laboratory contributions from Amanda Matala and Lori Maxwell. Veronique Theriault provided helpful advice on the permutation procedure. We thank William Young, Jay Hesse, Peter Galbreath, Jon Hess, Bob Lessard and anonymous reviewers for valuable suggestions improving previous versions of this manuscript. Funding for this research was provided by the Bonneville Power Administration.

References

- Anderson JH, Faulds PL, Atlas WI, Quinn TP (2012) Reproductive success of captive bred and naturally spawned Chinook salmon colonizing newly accessible habitat. *Evolutionary Applications*, **1752–4571**, 1–15.
- Araki H, Blouin MS (2005) Unbiased estimation of relative reproductive success of different groups: evaluation and correction of bias caused by parentage assignment errors. *Molecular Ecology*, **14**, 4097–4109.
- Araki H, Cooper B, Blouin MS (2007a) Genetic effects of captive breeding cause a rapid, cumulative fitness decline in the wild. *Science*, **318**, 100–103.

- Araki H, Ardren WR, Olsen E, Cooper B, Blouin MS (2007b) Reproductive success of captive-bred steelhead trout in the wild: evaluation of three hatchery programs in the Hood River. *Conservation Biology*, **21**, 181–190.
- Araki H, Cooper B, Blouin MS (2009) Carry-over effect of captive breeding reduces reproductive fitness of wild-born descendants in the wild. *Biology Letters*, **5**, 621–624.
- Banks MA, Blouin MS, Baldwin BA *et al.* (1999) Isolation and inheritance of novel microsatellites in Chinook salmon (*Oncorhynchus tshawytscha*). *Journal of Heredity*, **90**, 281–288.
- Berejikian BA, Van Doornik DM, Scheurer JA, Bush R (2009) Reproductive behavior and relative reproductive success of natural- and hatchery-origin Hood Canal summer chum salmon (*Oncorhynchus keta*). *Canadian Journal of Fisheries and Aquatic Sciences*, **66**, 781–789.
- Berejikian BA, Van Doornik DM, Endicott RC *et al.* (2010) Mating success of alternative male phenotypes and evidence for frequency-dependent selection in Chinook salmon, *Oncorhynchus tshawytscha*. *Canadian Journal of Fisheries and Aquatic Sciences*, **67**, 1933–1941.
- Berntson EA, Carmichael RW, Flesher MW, Ward EJ, Moran P (2011) Diminished reproductive success of Steelhead from a hatchery supplementation program (Little Sheep Creek, Imnaha Basin, Oregon). *Transactions of the American Fisheries Society*, **140**, 685–698.
- Cairney M, Taggart JB, Hoyheim B (2000) Atlantic salmon (*Salmo salar* L) and cross-species amplification in other salmonids. *Molecular Ecology*, **9**, 2175–2178.
- Chilcote MW, Leider SA, Loch JJ (1986) Differential reproductive success of hatchery and wild summer-run steelhead under natural conditions. *Transactions of the American Fisheries Society*, **115**, 726–735.
- Chilcote MW, Goodson KW, Falcy MR (2011) Reduced recruitment performance in natural populations of anadromous salmonids associated with hatchery-reared fish. *Canadian Journal of Fisheries and Aquatic Sciences*, **68**, 511–522.
- Christie MR, Marine ML, French RA, Blouin MS (2011) Genetic adaptation to captivity can occur in a single generation. *Proceedings of the National Academy of Sciences of the United States of America*, **109**, 238–242.
- Cuenco ML, Backman TWH, Mundy PR (1993) The use of supplementation to aid in natural stock restoration. In: *Genetic Conservation of Salmonid Fisheries* (eds Cloud JG, Thorgaard GH), pp. 269–293. Plenum Press, New York.
- Duchesne P, Bernatchez L (2002) An analytical investigation of the dynamics of inbreeding in multi-generation supportive breeding. *Conservation Genetics*, **3**, 47–60.
- Duchesne P, Etienne C, Bernatchez L (2006) PERM: A computer program to detect structuring factors in meaningful social units. *Molecular Ecology Notes*, **6**, 965–976.
- Eldridge WH, Myers JM, Naish KA (2009) Long-term changes in the fine-scale population structure of coho salmon populations (*Oncorhynchus kisutch*). *Heredity*, **103**, 299–309.
- Fleming IA, Gross MR (1993) Breeding success of hatchery and wild coho salmon (*Oncorhynchus kisutch*) in competition. *Ecological Applications*, **3**, 230–245.
- Fleming IA, Jonsson B, Gross MR, Lamberg A (1996) An experimental study of the reproductive behaviour and success of farmed and wild Atlantic Salmon (*Salmo salar*). *Journal of Applied Ecology*, **33**, 905.
- Foote CJ, Brown GS, Wood CC (1997) Spawning success of males using alternative mating tactics in sockeye salmon, *Oncorhynchus nerka*. *Canadian Journal of Fisheries and Aquatic Sciences*, **54**, 1785–1795.
- Ford MJ (2002) Selection in captivity during supportive breeding may reduce fitness in the wild. *Conservation Biology*, **16**, 815–825.
- Ford MJ, Hard JJ, Boelts B, LaHood E, Miller J (2008) Estimates of natural selection in a salmon population in captive and natural environments. *Conservation Biology*, **22**, 783–794.
- Frankham R (2008) Genetic adaptation to captivity in species conservation programs. *Molecular Ecology*, **17**, 325–333.
- Frankham R, Loebel DA (1992) Modeling problems in conservation genetics using captive *Drosophila* populations: rapid genetic adaptation to captivity. *Zoo Biology*, **11**, 333–342.
- Frankham R, Ballou JD, Briscoe DA (2002) Introduction to Conservation Genetics, pp. 419–447. Cambridge University Press, Cambridge, UK.
- Fraser DJ (2008) How well can captive breeding programs conserve biodiversity? A review of salmonids. *Evolutionary Applications*, **1**, 535–586.
- Goodman D (2005) Selection equilibrium for hatchery and wild spawning fitness in integrated breeding programs. *Canadian Journal of Fisheries and Aquatic Sciences*, **62**, 374–389.
- Greig C, Banks MA (1999) Five multiplexed microsatellite loci for rapid response run identification of California's endangered winter Chinook salmon. *Animal Genetics*, **30**, 316–317.
- Greig C, Jacobson DP, Banks MA (2003) New tetranucleotide microsatellites for fine-scale discrimination among endangered Chinook salmon (*Oncorhynchus tshawytscha*). *Molecular Ecology Notes*, **3**, 376–379.
- Heath DD, Heath JW, Bryden CA, Johnson RM, Fox CW (2003) Rapid evolution of egg size in captive salmon. *Science*, **299**, 1738–1740.
- Interior Columbia Technical Recovery Team (ICTRT) (2005) Interior Columbia Basin TRT: Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs. Attachment E: Population/Major Population Grouping Summaries (by ESU). Available at: http://www.nwfsc.noaa.gov/trt/trt_documents/viability2005_july_draft.pdf (accessed 12 March 2012).
- IUCN (1998) Guidelines for Reintroductions. Available at: <http://www.iucn.org/knowledge/tools/tools/conservation/> (Accessed 12 March 2012).
- Jonsson JI, Petersson E, Jonsson E, Björnsson BT, Jarvi T (1996) Domestication and growth hormone alter antipredator behaviour and growth patterns in juvenile brown trout, *Salmo trutta*. *Canadian Journal of Fisheries and Aquatic Sciences*, **53**, 1546–1554.
- Kalinowski ST, Taper ML, Marshall TC (2007) Revising how the computer program CERVUS accommodates genotyping error increases success in paternity assignment. *Molecular Ecology*, **16**, 1099–1106.
- Laikre L, Schwartz MK, Waples RS, Ryman N, The GeM Working Group (2010) Compromising genetic diversity in the wild: unmonitored large-scale release of plants and animals. *Trends in Ecology and Evolution*, **25**, 520–529.
- Larsen DA, Beckman BR, Cooper KA *et al.* (2004) Assessment of high rates of precocious male maturation in a

- spring Chinook salmon supplementation hatchery program. *Transactions of the American Fisheries Society*, **133**, 98–120.
- Lynch M, O'Hely M (2001) Captive breeding and the genetic fitness of natural populations. *Conservation Genetics*, **2**, 363–378.
- Marshall TC, Slate J, Kruuk LEB, Pemberton JM (1998) Statistical confidence for likelihood-based paternity inference in natural populations. *Molecular Ecology*, **7**, 639–655.
- Matala AP, Young W, Vogel JL, Narum SR (2012) Influences of hatchery supplementation, spawner distribution and habitat on genetic structure of Chinook salmon (*Oncorhynchus tshawytscha*) in the South Fork Salmon River, ID. *North American Journal of Fisheries Management*, **32**, 346–359.
- McGinnity P, Jennings E, deEyto E *et al.* (2009) Impact of naturally spawning captive-bred Atlantic salmon on wild populations: depressed recruitment and increased risk of climate-mediated extinction. *Proceedings of the Royal Society of London, Series B*, **276**, 3601–3610.
- McLean JE, Bentzen P, Quinn TP (2003) Differential reproductive success of sympatric, naturally spawning hatchery and wild steelhead trout (*Oncorhynchus mykiss*) through the adult stage. *Canadian Journal of Fisheries and Aquatic Sciences*, **60**, 433–440.
- Naish KA, Taylor JE, Levin PS *et al.* (2007) An evaluation of the effects of conservation and fishery enhancement hatcheries on wild populations of salmon. *Advances in Marine Biology*, **53**, 61–194.
- Narum SR, Hess JE, Matala AP (2010) Examining genetic lineages of Chinook salmon in the Columbia River Basin. *Transactions of the American Fisheries Society*, **139**, 1465–1477.
- Nelson RJ, Beacham TD (1999) Isolation and cross species amplification of microsatellite loci useful for study of Pacific salmon. *Animal Genetics*, **30**, 228–229.
- Olsen JB, Bentzen P, Seeb JE (1998) Characterization of seven microsatellite loci derived from pink salmon. *Molecular Ecology*, **7**, 1087–1089.
- Paquet PJ, Flagg T, Appleby A *et al.* (2011) Hatcheries, conservation, and sustainable fisheries—achieving multiple goals: results of the Hatchery Scientific Review Group's Columbia River basin review. *Fisheries*, **36**, 547–561.
- Pearsons TN, Fritts AL, Scott JL (2007) The effects of hatchery domestication on competitive dominance of juvenile spring Chinook salmon (*Oncorhynchus tshawytscha*). *Canadian Journal of Fisheries and Aquatic Sciences*, **64**, 803–812.
- Rabe CD, Nelson DD (2010) Status and Monitoring of Natural and Supplemented Chinook Salmon in Johnson Creek, Idaho. Report of Nez Perce Tribe to Bonneville Power Administration, Portland, Oregon. Available at: <https://pisces.bpa.gov/release/documents/documentviewer.aspx?doc=P124099>.
- Reisenbichler RR, Rubin S, Wetzel L, Phelps S (2004) Natural selection after release from a hatchery leads to domestication in steelhead, *Oncorhynchus mykiss*. In: *Stock Enhancement and Sea Ranching* (eds Leber M, Kitada S, Blankenship HL, Svasand T), pp. 371–384. Blackwell Publishing Ltd, Oxford.
- Rexroad CE, Coleman RL, Martin AM, Hershberger WK, Killefer J (2001) Thirty-five polymorphic microsatellite markers for rainbow trout (*Oncorhynchus mykiss*). *Animal Genetics*, **32**, 317–319.
- Schroder SL, Knudsen CM, Pearsons TN *et al.* (2008) Breeding success of wild and first generation hatchery female spring Chinook salmon spawning in an artificial stream. *Transactions of the American Fisheries Society*, **137**, 1475–1489.
- Schroder SL, Knudsen CM, Pearsons TN *et al.* (2010) Behavior and breeding success of wild and first generation hatchery male spring Chinook Salmon spawning in an artificial stream. *Transactions of the American Fisheries Society*, **139**, 989–1003.
- Shuster SM, Miller MP, Lang BK, Zorich N, Huynh L, Keim P (2005) The effects of controlled propagation on an endangered species: genetic differentiation and divergence in body size among native and captive populations of the Socorro Isopod (Crustacea: Flabellifera). *Conservation Genetics*, **6**, 355–368.
- Therault V, Moyer GR, Jackson LS, Blouin MS, Banks MA (2011) Reduced reproductive success of hatchery Coho salmon in the wild: insights into most likely mechanisms. *Molecular Ecology*, **20**, 1860–1869.
- Wang J, Ryman N (2001) Genetic effects of multiple generations of supportive breeding. *Conservation Biology*, **15**, 1619–1631.
- Wang S, Hard JJ, Utter FM (2002) Salmonid inbreeding: a review. *Reviews in Fish Biology and Fisheries*, **11**, 301–319.
- Waples RS, Gustafson RG, Weitkamp LA *et al.* (2001) Characterizing diversity in salmon from the Pacific Northwest. *Journal of Fish Biology*, **59**, 1–41.
- Waples RS, Ford MJ, Schmitt D (2007) Empirical results of salmon supplementation in the Northeast Pacific: a preliminary assessment. In: *Ecological and Genetic Implications of Aquaculture Activities* (ed. Bert TM), pp. 383–403. Kluwer Academic Publishers, Dordrecht, Netherlands.
- Williams SE, Hoffman EA (2009) Minimizing genetic adaptation in captive breeding programs: A review. *Biological Conservation*, **142**, 2388–2400.
- Williamson KS, Cordes JF, May B (2002) Characterization of microsatellite loci in Chinook salmon (*Oncorhynchus tshawytscha*) and cross-species amplification in other salmonids. *Molecular Ecology Notes*, **2**, 17–19.
- Williamson KS, Murdoch AR, Pearsons TN, Ward EJ, Ford MJ (2010) Factors influencing the relative fitness of hatchery and wild spring Chinook salmon (*Oncorhynchus tshawytscha*) in the Wenatchee River, Washington, USA. *Canadian Journal of Fisheries and Aquatic Sciences*, **67**, 1840–1851.

M.A.H. is a conservation geneticist studying reproductive success of salmonid fishes using parentage based tagging as a tool for conservation and management. C.D.R. is a lead fisheries biologist involved with restoring Chinook salmon. J.L.V. leads research studies contributing to fisheries management. J.J.S. is a conservation geneticist and laboratory manager studying salmon and steelhead. D.D.N. is a fisheries biologist studying salmon. S.R.N. is a conservation geneticist who leads a research group interested in population genetics, local adaptation, and reproductive success of salmonid fishes.

Data accessibility

Sample locations and microsatellite data: DRYAD entry doi: 10.5061/dryad.19p14.

Supporting information

Additional Supporting Information may be found in the online version of this article.

Table S1 Summary statistics for each microsatellite locus.

Table S2 Number of individuals by origin for each return year that were genotyped for this study, and were included in parentage analysis.

Table S3 Relative reproductive success (RRS) of female, male and jack F_1 fish (including potential parents producing zero adult offspring) from BY 1998 and 2000.

Table S4 Supplementary information for Table 2, showing the proportion of F_1 fish (from BY 1998 and 2000) that produced one or more returning adult offspring in 2002–2004.

Table S5 Supplementary information for Table 3, showing average reproductive success (RS) and variance estimates.

Fig. S1 Histogram of estimated fitness (i.e. number of offspring produced) for hatchery- and wild-origin female natural spawners from 1998 through 2005.

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From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Saturday, October 19, 2019 12:28:53 PM

Name	Ralph Veldink
Email	rveldink@yahoo.com
Address	Portland Oregon
Comments	Please abide by the Kitzhaber agreement. The time for gill nets to be removed from the Columbia River has been extended by a full 2 years. Enough is enough. Take the politics out of fishing. Do what you agreed to do.
Attachment	

The message has been sent from 76.105.178.162 (United States) at 2019-10-19 15:28:50 on Chrome 77.0.3865.120
Entry ID: 73

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 12:05:15 PM

Name	Richard Bomhoff
Email	rlbomhoff@hotmail.com
Address	33506 Canaan Rd, Deer Island OR
Comments	It seems to me that the direction the ODFW and WDFW are heading we might as well all quit fishing and sell our boats. So where will these agency's get the money for all there salary's? If big business ran there company's like ODFW and WDFW they would all go broke.
Attachment	

The message has been sent from 97.120.83.83 (United States) at 2019-10-20 15:05:11 on Internet Explorer 11.0
Entry ID: 82

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 9:43:37 PM

Name	Dale Carper
Email	Turkeydale@comcast.net
Address	Portland Oregon
Comments	<p>Dear Columbia River Commissioners,</p> <p>I am one of thousands in Oregon who contributes large amounts of my hard earned pay check to the local fishing industry every year! I am a "Sport Fisherman"! Why do we need "Gillnets"? A simple question! The truth is we don't! Not for restaurants, grocery stores, or any other large retailers needs! "Fair Chase" in every aspect of fish and game gathering and should be the norm! It is not fair chase to destroy a fishery for the benefit of just a few! The Columbia River is not private. It is in the "Public Domain" and should remain this way! Let the "Gillnetters" use long line legal commercial fishing tactics. There harvest will still be large but won't indiscriminately kill other species. Mass hunting and fishing has a very bloody and horrific history in the United States! We have many extinct species because of these practices. Let's not continue to brush up next to this terrible history in our state! I strongly oppose proposals to abandon the bi-state Columbia River fishery reforms and return non-selective gillnets to the mainstem Columbia River. Non-selective gillnets do not belong in mixed-stock lower Columbia River fisheries where endangered salmon and steelhead are present. Gillnets are incapable of selectively harvesting hatchery fish, which is key to recovering wild salmon populations and meeting federal hatchery reform requirements to maintaining hatchery production. Instead of falling back on indiscriminate, industrial commercial gillnetting, our region must fully transition to fisheries capable of selective harvest - recreational and commercial - to harvest more hatchery and healthy wild stocks of salmon within the limited number of endangered salmon and steelhead that may be impacted in state fisheries. Our goal should be to get more wild salmon back to the spawning grounds, not merely the bare minimum. The bi-state reforms are the result of significant effort and compromise, including increased hatchery production to benefit gillnet harvests in off-channel areas. Efforts to undo the reforms put this hatchery production and the funding available for Columbia River salmon management at risk. Efforts to extend Washington's Columbia River endorsement fee were recently</p>

rejected by their state legislature and Oregon's endorsement must be reauthorized next year. One key purpose of the bi-state reforms was to enhance the overall economic benefits of the fishery and provide more certainty for fisheries - it was never to increase gillnet industry profits. I urge you to reject any further efforts to abandon the Columbia River reforms and hold the agencies accountable for their implementation.

Sincerely,

Dale Carper

Attachment

The message has been sent from 24.20.145.51 (United States) at 2019-10-21 00:43:34 on Chrome 77.0.3865.120
Entry ID: 85

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 10:39:21 PM

Name	Ronald Easley
Email	reeasley1000@comcast.net
Address	10705 SE Evergreen Highway, Vancouver 98664 Washington
Comments	<p>Please support the Columbia River Reforms as agreed to and paid for through additional licensing fee's by sportman. The State of Washington should be a world class fishing desintation, generating tremendous revenue for area business, county and state governments. In stead, fisherman fly to other areas around the world where fishery's are better managed to protect the natural resources to generate income for local businesses. Gillnets are nonselective and non-native gillnet fishers are not needed to take hatchery fish out of the river system as proposed by some officials.</p> <p>Please reverse course and save this great natural resource that we have before it is gone.</p> <p>Thank you, Ron Easley</p>
Attachment	

The message has been sent from 98.246.80.206 (United States) at 2019-10-21 01:38:47 on Edge 18.17763
Entry ID: 86

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 6:54:01 PM

Name	Randy Klobas
Email	spikeklobas@gmail.com
Address	Tillamook OR
Comments	This gill net problem needs to be delt with once and for all. Kill the harvesting of gill net salmon(I mean end it) . The bycatch alone is reason enough. The rules and regulations on recreational fishing makes us look like idiots compared to gill netters. They can catch and kill what ever they want. We get fined just for catching the wrong fish ODFW needs to be reworked too.
Attachment	

The message has been sent from 63.225.84.100 (United States) at 2019-10-20 21:53:58 on Chrome 77.0.3865.120
Entry ID: 84

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 12:08:44 AM

Name	Dale Lyster
Email	lyster1@comcast.net
Address	Corvallis OR
Comments	Do NOT reverse Columbia KILL Nets decisions. As I see the issue. money has been stolen from sport fishers if non-selective Gil Nets are re-introduced to the Columbia River. Keep Commercial Gil Nets out!
Attachment	

The message has been sent from 73.96.52.170 (United States) at 2019-10-20 01:04:07 on Chrome 77.0.3865.120
Entry ID: 77

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 12:57:43 PM

Name	Jeffrey Monaco
Email	jeff@flamingojimsgifts.com
Address	Tillamook Oregon
Comments	<p>We all know that gillnets kill indiscriminately, so why is this continuing to be brought forth for reconsideration? Let them go the way of the dinosaurs already. No one wants to put people out of work, but gillnets are only going to continue adding nails to this industries coffin. These fish populations are continuing to plummet, and to think that business as usual is to the commercial guys benefit is just plain, shortsighted stupidity.</p> <p>With the money wasted on both sides of this argument, every commercial boat on the Columbia could have been re-equipped with modern, selective alternatives by now. Help these guys transition towards a sustainable future, or help retrain them to do something else. Either they cannot afford the upgrade and are stuck between a rock and a hard place, trying to provide for a living, or they don't care about their impact. Either way they must know in their hearts that gillnet practices are wrong, both logically and morally.</p> <p>Salmonids cannot speak for themselves, so it is up to us to stand up for their survival in the face of the monumental disadvantages they face. Climate change, deforestation which leads to the loss of breeding habitat, deteriorating ocean conditions, the assault on hatchery production, over-fishing and indiscriminate netting practices (etc., etc.) combine to form a pretty bleak future for them to ever make the comeback we have hoped for.</p> <p>As the stewards for our fish, it is up to you to help them any way you can. Please stand up for the reforms that have been made in a loud, solid voice that will get the point across once and for all that gillnets are through here forever.</p> <p>Remember that the vast, vast majority of us are rooting for our fish.</p> <p>So.....</p> <p>I strongly oppose proposals to abandon the bi-state Columbia River fishery reforms and return non-selective gillnets to the</p>

mainstem Columbia River. Non-selective gillnets do not belong in mixed-stock lower Columbia River fisheries where endangered salmon and steelhead are present. Gillnets are incapable of selectively harvesting hatchery fish, which is key to recovering wild salmon populations and meeting federal hatchery reform requirements to maintaining hatchery production.

Instead of falling back on indiscriminate, industrial commercial gillnetting, our region must fully transition to fisheries capable of selective harvest - recreational and commercial - to harvest more hatchery and healthy wild stocks of salmon within the limited number of endangered salmon and steelhead that may be impacted in state fisheries. Our goal should be to get more wild salmon back to the spawning grounds, not merely the bare minimum.

The bi-state reforms are the result of significant effort and compromise, including increased hatchery production to benefit gillnet harvests in off-channel areas. Efforts to undo the reforms put this hatchery production and the funding available for Columbia River salmon management at risk. Efforts to extend Washington's Columbia River endorsement fee were recently rejected by their state legislature and Oregon's endorsement must be reauthorized next year.

One key purpose of the bi-state reforms was to enhance the overall economic benefits of the fishery and provide more certainty for fisheries - it was never to increase gillnet industry profits.

I urge you to reject any further efforts to abandon the Columbia River reforms and hold the agencies accountable for their implementation.

Attachment

The message has been sent from 24.216.243.61 (United States) at 2019-10-20 15:57:40 on Firefox 69.0
Entry ID: 82

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 10:31:19 AM

Name	James Russell
Email	Jim.R.Russell@gmail.com
Address	Corvallis OR
Comments	DO NOT RESTORE THE NON-SELECTIVE MAINSTEM GILLNETTING REFORMS, it harms and kills many non targeted species, and you know it. If you truly and fairly considered whats best for the fish and "all" stakeholders, you would never consider this. I am one of the many thousands of Oregonians that oppose this action and I intend to show my opposition by supporting (with increased donations) the CCA.
Attachment	

The message has been sent from 71.237.223.109 (United States) at 2019-10-20 13:31:16 on Chrome 77.0.3865.120
Entry ID: 79

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 11:23:19 AM

Name	Gene Spooner
Email	gspooner2@gmail.com
Address	Ocean Shores Wa
Comments	<p>I have lived in Washington all my life. I have fished for over 70 years. I have two boats, one so I can fish in the Ocean and one to take in the lakes and rivers. The fishing for Salmon and Steelhead has become so bad I am seriously thinking about selling them both and no longer buying hunting and fishing licenses. As a lifelong outdoors person I believe that my Grandkids will not have the the thrill of hooking a salmon or steelhead because the the actions of our WDFW. I can't believe they don't care about ignoring the facts of the dangers of loosing the Salmon and Steelhead by allowing gill netting in the Columbia River. We are the only state in the US that allow gill netting in a River. I hope you and your other associates tell the WDFW to not allow gill netting in Columbia River.</p> <p>Thank you Gene Spooner</p>
Attachment	

The message has been sent from 216.116.6.180 (United States) at 2019-10-20 14:23:15 on iPhone 13.0.1
Entry ID: 80

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 3:05:30 PM

Name	Keith Weathers
Email	L8bear@aol.com
Address	Salem OR
Comments	<p>A century ago both of my grandfather s were homesteaders in Oregon. They relied on their farms to feed their families, but they fished the plentiful runs of salmon to garnish their diets. Salmon were incredibly more numerous then, but today I am still blessed to treat my children and grandchildren to the satisfaction of catching an occasional salmon and eating it together around the family table.</p> <p>There are many threats to Northwest salmon in the wild from human actions, so their numbers and their futures are threatened. The fish need successful spawning runs to survive, so non-selective gill netting in the mainstream of our great Columbia river fish highway is both unscientific and unconscionable.</p> <p>If my great-grandchildren are to have this cultural treasure preserved - even in small measure - for their participation, then this is the time for Oregon and Washington wildlife departments to follow the best science and take the most honorable steps toward preserving - even strengthening - these fish runs. A giant step toward this will be the sole reliance on selective gill netting in the main stem of the Lower Columbia. Please do the most scientific and honorable thing! Thank you!</p>
Attachment	

The message has been sent from 76.115.215.188 (United States) at 2019-10-20 18:05:27 on Safari 13.0.2
Entry ID: 83

From: [123ContactForm](#)
To: [Dobler, Myrtice C \(DFW\)](#)
Subject: Contact the Policy Review Committee
Date: Sunday, October 20, 2019 7:51:35 AM

Name	Bruce Williams
Email	bewilliams16@gmail.com
Address	601 Seabird Drive SW, Bandon, OR 97411 OR
Comments	As an avid Oregon fisherman and retired biologist, I urge you not to abandon fishery reforms currently in place and return gill-netting to the mainstem Columbia River. Our beleaguered salmonid populations need more protections, not less. You should be doing everything in your power to ensure these steelhead and salmon will thrive for future generations, not bowing to commercial fishing interests. Please, do the right thing for the resource!
Attachment	

The message has been sent from 68.113.34.147 (United States) at 2019-10-20 10:51:32 on Chrome 77.0.3865.120
Entry ID: 78