Craig Medred

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COMMENTARY

Zero-sum fishery

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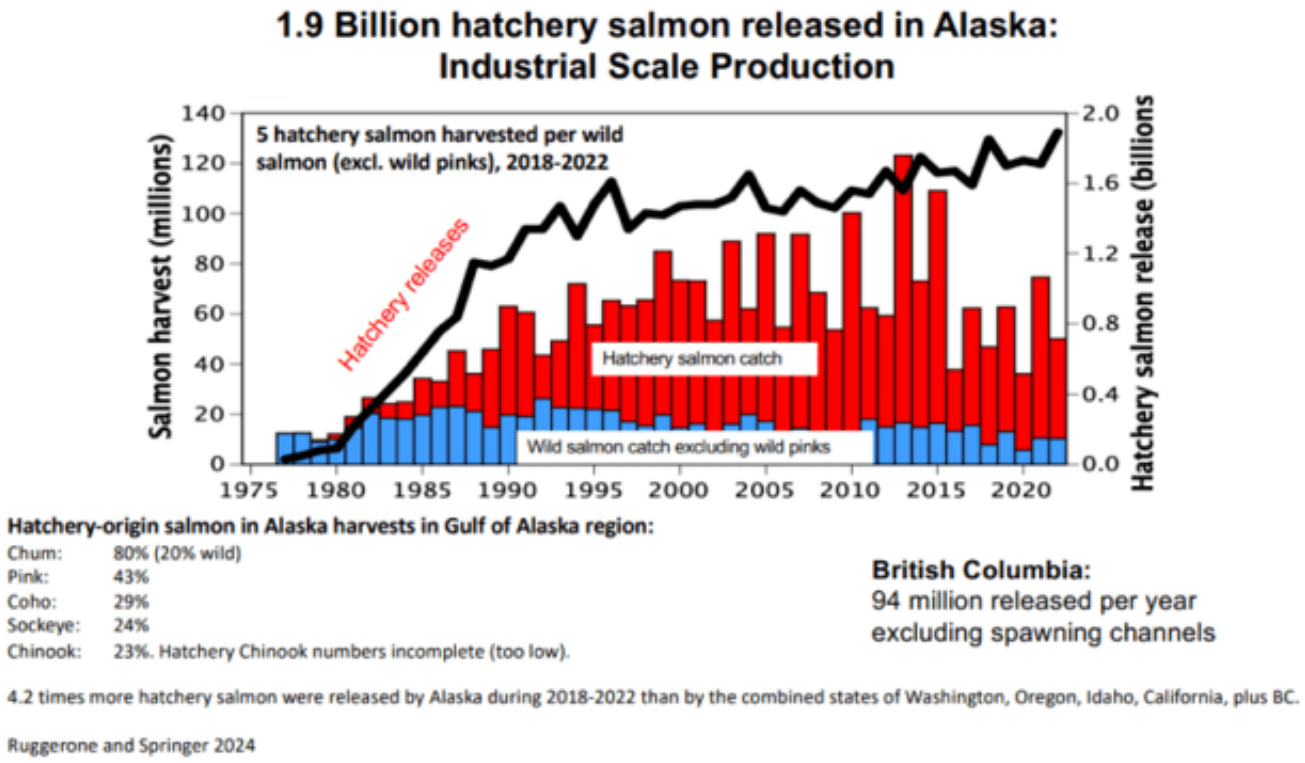

Are wild salmon the ultimate loser?

A news analysis

Alaska salmon farmers who annually turn almost 2 billion hatchery fish loose to feed on the pastures of the North Pacific Ocean finally appear to have caught the attention of Canadians who've for years have watched their wild salmon return generally smaller and fewer in number.

Some of those in attendance at the Pacific Salmon Foundation's BC Salmon Recovery & Resilience Conference in Vancouver, British Columbia, Canada (https://psf.ca/events/conference/), at the start of the month said Seattle-based scientist Greg Ruggerone generated some buzz when he popped the above slide onto the big screen during a talk about a warm North Pacific crowded with salmon.

The graphic was an in-your-face portrait of how heavily Alaska has invested in hatcheries to free-range farmed salmon for profit. As a result, Alaska now annually sends to sea 4.2 times as many salmon as the hatcheries of British Columbia, Washington state, Oregon and California combined.

Most of the Alaska salmon are smallish pinks or what Alaskans often call humpies, (https://craigmedred.news/2023/09/30/wild-fish-aid/comment-page-1/)and their numbers have gone steadily up over the decades as the numbers of wild Chinook (king), coho, sockeye and chum salmon have gone down, except in Alaska's Bristol where the sockeye, the predominate species there, get a break from competition with pinks in nearshore waters.

Ruggerone and Canadian colleague James Irvine in 2018 authored a study reporting that in part thanks to hatcheries in Alaska, Russia, Japan and Korea, there are now more salmon in the Pacific than at any time in human history, but with those humpies, the smallest and least valuable of salmon, dominant.

The study was accepted by other scientists as the most accurate assessment of Pacific salmon numbers to date.

Ruggerone and Irvine later detailed a troubling relationship between those humpies and the bigger and more valuable salmon species, reporting that as the numbers of pinks went up -the numbers of Chinook, sockeye, chum and coho went down in both size and number with wild salmon from Canada and the Pacific Northwest taking the biggest hit. (https://craigmedred.news/2024/03/01/pink-problems/)

"It is important to recognize that in the present era," they wrote in ICES Journal of Marine Science, "hatchery releases represent a classic 'zero-sum' game, where an incremental increase in hatchery releases results in some loss of growth and productivity of wild salmon through increased competition at sea."

The decline in other species of salmon, especially wild Chinook, is now widely accepted. Chinook numbers have fallen to the point that several Canadian and Lower-48 state runs are considered threatened, and the National Oceanic and Atmospheric Administration is now reviewing whether Alaska Chinook should be added to the U.S. Endangered Species list as one of those threatened species.

(https://craigmedred.news/2024/05/23/endangered-chinook/)

What role pinks, and especially hatchery pinks, have played in these declines remains, however, a subject of debate with a lot of money in play in Alaska. Alaska Department of Fish and Game scientist Bill Templin, the chief of commercial fisheries research for the state, has mocked the studies of Ruggerone and others, and argued that while they can show a correlation between increased pink

numbers and decreased numbers of other salmon, they can't prove the former caused the latter.
(https://craigmedred.news/2018/10/17/win-for-ak-hatcheries/)

The state, it should be noted, is heavily invested in hatcheries.

Alaska spent millions building Prince William Sound hatcheries in Prince William Sound that it later handed over to commercial fishermen to operate as "private, non-profit" (PNP) salmon factories. Those hatcheries created a major salmon fishery where only a minor salmon fishery existed before.

(https://craigmedred.news/2018/11/05/the-hatchery-case/)

Vested interests

Only time will tell if Ruggerone's pitch to the salmon Recovery Conference will focus more attention on the decline of wild salmon at sea, but if the past is any president, it is unlikely anything will change.

Why? Because there is no entity pushing to improve the survival of wild salmon at sea and a variety of entities invested in agendas that encourage them to ignore the issue of what happens to wild salmon in what Templin dismissed as the big "black box" of the ocean.

To start with, there are the obvious players. Alaska salmon processors who struggle to compete with farmed salmon when it comes to selling high-value salmon filets, but still have the market for canned salmon largely to themselves.

When they can buy the raw product for 38 cents per pound, as state records indicate they did last year, (https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyfisherysalmon.salmoncatch_statewide) there is profit in selling canned salmon that retails for around $4.35 per pound as human food (https://www.instacart.com/products/34079-kroger-alaskan-pink-salmon-14-75-oz?retailer_id=200&product_id=34079&region_id=3859160347&utm_medium=sem_shopping&utm_source=instacart_google&utm_campaign=ad_demand_shopping_rp_food_all-non-ca_evergreen_maize_treatment_dma&utm_content=accountid-8145171519_campaignid-21096331191_adgroupid-170199877386_device-c&utm_term=targetid-aud-1930465835203:pla-850267369359_locationid-9191083_adtype-pla_productchannel-online_merchantid-143363647_storecode-_productid-34079&gad_source=1&gclid=Cj0KCQiAx9q6BhCDARIsACwUxu6hd3aOMcEYer9HGJE3T_Lr3EVgZOn09Osh_WJ-FIHnbmxgnbR2EHsaAq-HEALw_wcB) or up to $5.30 per pound as dog food. (https://www.chewy.com/petkind-thats-it-wild-salmon-grain/dp/56014?utm_source=google-product&utm_medium=cpc&utm_campaign=20633272752&utm_content=&gad_source=1&gclid=Cj0KCQiAx9q6BhCDARIsACwUxu6hjnBCJqBDFZw0uuYI_-A5ZvrAtXQB2bwDxj3SbB7jjLZGU2dzjA4aAm6FEALw_wcB)

Add in sales of fish meal or fish paste made from salmon heads and trimming (https://www.alaskaseafood.org/wp-content/uploads/Full-Specialty-Products-Document-Final-Revised-April-2018.pdf) and the potential for profits to be made off of high-volumes of pink salmon bought cheap only increase. Then there are the relative handful of commercial salmon seiners who profit from pinks and the hatcheries themselves, which now provide some of the best and most stable jobs in the Alaska fishing business.

(https://craigmedred.news/2022/01/27/and-the-winners-are/)

None of these people have any reason to care about what happens to wild fish in the ocean as long as

lots of hatchery salmon keep coming back. And, sadly, environmental organizations don't have much of a reason to care either.

At the national level, most of them are firmly focused on saving the world from climate change/global warming – call it whatever you prefer – and it is better for them to blame declines in high-value salmon on warming Pacific waters than to get into discussions about declines linked to food competition among salmon.

For their purposes, talking about food competition between salmon at sea is just a distraction from the bigger and more important issue.

Meanwhile, at the regional level, the Canadians have made a publicly funded industry out of watershed rehabilitation and enhancement, although it doesn't seem to have produced any results, and in the process created a workforce that benefits from the poor survival of wild salmon that drive ever more spending on rehabilitation and enhancement

Bob Hooton, a retired fisheries biologist in British Columbia, has written about some of this, the lastest being a story about a proposed, $2.21 million Skeena River fish trap that never materialized. It was intended to harvest salmon while allowing steelhead trout, a very high-value species in Canada, to escape upriver unharmed. (https://wcoutpost.ca/2024/11/22/skeena-river-fish-trap-project-by-bob-hooton/)

The funding for the project, according to his report, went to Lax Kw'alaams Business Development Ltd. Lax Kw'alaams along with other B.C. tribal entities are tied into the British Columbia Salmon Restoration and Innovation Fund which, according to the Canadian government, supports "the efforts of the many First Nations, communities, stakeholder and stewardship groups, industry, and others in recovering the iconic wild salmon in this Province" of British Columbia. (https://www.dfo-mpo.gc.ca/fisheries-peches/initiatives/fish-fund-bc-fonds-peche-cb/results-report-rapport-resultats-22-23-eng.html)

The idea there is noble. The problem is that the focus on freshwater makes it easy for those benefiting from government spending to ignore salmon lost at sea given that if the big problem is in the ocean there is little reason to continue to spends of millions of dollars trying to improve freshwater habitats to boost returns.

Then, too, there are tribal links to net-pan salmon farms that keep some indigenous groups in the fishing business in Canada where the wild-caught harvest of salmon is down to almost nothing.

(https://www.seafoodsource.com/news/aquaculture/indigenous-groups-say-they-can-t-trust-canada-s-fisheries-minister-after-salmon-farm-decision)Some of these tribal groups are profiting nicely from Norwegian-style farms that produce salmon preferred by the marketplace while others tribal groups have joined environmentalists convinced the net-pen salmon farms are the reason for the large declines in the number of Canadian salmon.

Their role in the decline, if any, is unclear. (https://hakaimagazine.com/news/scientists-level-new-critiques-of-fisheries-and-oceans-canadas-scientific-rigor/) Scientists with Fisheries and Oceans Canada concluded that if there is any problem it is primarily with pink and chum salmon, which are not exactly the salmon most Canadians are fretting about. (https://www.dfo-mpo.gc.ca/csas-sccs/Publications/ScR-RS/2022/2022_045-eng.pdf)

Other scientists have disparaged the Oceans Canada research. (https://thenarwhal.ca/bc-dfo-sea-lice-report/) They had to those with a reason to look the other way when it comes to at-sea issues which might call into question their beliefs that net-pen farming is inherently bad though in terms of its environmental footprint the business looks tiny compared to the agriculture that has reshaped the American heartland.

Futher complicating this already complicated picture is the unexpected return this year of about 300,000 sockeye salmon to a hatchery on B.C.'s Okanagan River, which has a bunch of Canadians singing the praises of Alaska-style open-ocean farming versus net-pen farming though the results with that model in Canada to date have been dismal. (https://www.castanet.net/news/Penticton/513255/-Overwhelmed-with-fish-record-sockeye-run-numbers-through-Okanagan-Valley-with-salmon-returning-further-north)

Still, this adds to the distractions surrounding any serious discussion of the salmon carrying capacity of the Pacific. The Canadians now seem intent in investing in more hatcheries (https://www.canada.ca/en/fisheries-oceans/news/2024/08/government-of-canada-and-gitanyow-nation-partner-on-new-community-economic-development-hatchery-to-support-pacific-salmon.html) and ignoring the issue of that "zero sum" game even though there are good reasons to believe that adding more hatchery fish to an ocean at carrying capacity, if that is the case, simply results in replacing wild salmon with hatchery salmon, which appears to be the case with chums in Southeast Alaska. (https://craigmedred.news/2023/02/08/canadas-loss/)

Meanwhile, to the south of the Canada-U.S. border in the Pacific Northwest, regional environmental groups have devoted themselves to removing dams from the Columbia and Snake rivers. The reason for this is the belief the dams are the main cause of the region's salmon declines in the 21st Century.

But what if the dams aren't the biggest reason for these declines? What if ocean competition benefiting Alaska to the detriment of salmon returning to watersheds south of Alaska is the biggest reason for the declines?

If that is the case, selling the idea of dam removal becomes a whole lot harder. Funding for dam removal advocates is almost certain to shrink, and environmental organizations, which like most bureaucracies are staffed by chummy friends would have to start shrinking the size of their staffs, and that is never fun.

Thuw Lower 48 groups that claim to be all about supporting wild salmon have good reasons to ignore the at-sea competition with Alaska salmon that appears to be reducing, to some extent great or small, salmon returns to Canada and the Lower 48.

The goal of these groups is noble, too. There is little doubt the Columbia River system would be more productive salmon habitat with all of the dams gone. Removing them all might even be enough to negate the need for all of the U.S. hatcheries on which about $9 billion has been spent over the course of the last 40 years, according to William Jaeger, an Oregon State University professor of economics, and Mark Scheuerell, a fisheries biologist with the U.S. Geological Survey. (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0289246)

Closing those hatcheries, however, would put thousands of people out of work, and cost the regional

economy something on the order of $225 million per year if the numbers of Jaeger and Scheurerell are correct.

So add some more people to the mix of those with reasons to look away from the issue of salmon survival at sea – no matter how well illustrated this appeared in a study conducted by B.C.-based Kintama Research Services six years ago.

Canadian scientists David Welch and colleagues there documented a 65 percent decline in the productivity of Chinook salmon from Oregon north to the northern end of the Alaska Panhandle over the past half century. (https://craigmedred.news/2019/09/15/overlookment/) Their peer-reviewed study was finally published in Fish and Fisheries in 2020 after spending two years in review with those who feared its finding that Chinook in undammed streams in Alaska were struggling as badly as those in dammed watersheds might weaken arguments for dam removals. (https://craigmedred.news/2020/11/02/vanishing-kings/)

Chinook are the big fish Alaskans call "king salmon." (https://www.adfg.alaska.gov/index.cfm?adfg=chinook.printerfriendly#:~:text=Chinook%20are%20Alaska's%20state%20fish,3%2C845%20km%20upstream%20to%20spawn.) King salmon, the Alaska state fish, can reach weights of up to 100 pounds, making your average 3.1-pound pink look like bait. Their size, their eating quality, and their comparatively low abundance even in the best of times also makes them the most valuable and coveted of Pacific salmon.

Nothing new

Ironically, it was Canadian fisheries scientists who more than 15 years ago first ointed out the potential problem about which Ruggerone and other scientists are now warning.

"A common-pool problem in the (https://www.sciencedirect.com/science/article/abs/pii/S0308597X07001303)North Pacific Ocean (https://www.sciencedirect.com/topics/earth-and-planetary-sciences/north-pacific-ocean) that remains largely ignored in international (https://www.sciencedirect.com/science/article/abs/pii/S0308597X07001303)policy is competition for prey resources among salmon populations from different countries," they wrote in the peer-reviewed Journal of Marine Policy. "Hatcheries release large abundances of juvenile salmon into the North Pacific and the resulting decrease in mean body size of adult wild and hatchery salmon may lead to reductions in benefits." (https://www.sciencedirect.com/science/article/abs/pii/S0308597X07001303)

At the time their work was published in 2008, the reductions in size of salmon were only starting to become clear, but the researchers were already confident in declaring that "ecological studies of prey intake from stomach contents of salmon suggest that these populations and species compete for a limited pool of temporally varying prey in relatively small and productive regions in the ocean."

They recognized then that ocean wasn't one big pool of sameness, that beneath the waves ocean habitats were like land habitats. Some good, some bad and some inbetween.

"Increased competition can reduce body growth of salmon….a comparison of population abundances and scale circuli counts across species suggested that in years when Asian pink salmon were abundant, age-specific growth (as well as survival rates) of sockeye salmon from Bristol Bay, Alaska, was reduced due to increased competition for prey, for example zooplankton and micronekton, such as squid and

small fishes in the region of overlap in their ocean distribution," they wrote. RC090

Ever-increasing hatchery releases of salmon would without a doubt be a good thing if the pastures of the Pacific were capable of producing endlessly more salmon, but the opposite is true if those pastures have indeed reached their carrying capacity, as many scientists now believe, and the ocean is at the "zero-sum" game described in the ICES Journal of Marine Science.

Alaska interests, however, have had no good reasons to care about this. Until this year's collapse of pink salmon returns to the Sound, which the state says was "largely due to hatchery pink salmon run failures," (https://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1642055378.pdf) Alaska has been basking in decades of nothing but hatchery salmon success with only comparatively mild reductions in wild fish size and numbers.

When the Fairbanks-based advocates for wild salmon and the Kenai River Sportfishing Association tried to get the Alaska Board of Fisheries to reel in Alaska hatchery releases in 2018, hatchery backers trooped before the Board to argue that it shouldn't "mess around with what works," as the late Clem Tillion from Halibut Cove on the Kenai Peninsula put it.

A former state senator and the Alaska "fisheries czar" under the former and late Gov. Wally Hickel, the then 92-year-old Tillion was called into service by hatcher advocates to underline the idea that "the hatchery program has been a success," and "this idea that we're over-stressing the North Pacific? What we're doing is chicken feed." (https://craigmedred.news/2018/10/17/win-for-ak-hatcheries/)

Tillion didn't, however, stop there. He went on to offer a perfectly jingoistic response to the suggestion Alaska hatchery salmon were overrunning the Pacific, arguing that if there was indeed a problem with too many hatchery fish it was the fault of the North Koreans, whose hatchery production is unknown, and the Russians, who actually release fewer salmon than the state of Alaska.

The North Pacific Anadromous Fish Commission, a treaty organization, reports a 2024 Russian release of about 1.64 billion hatchery salmon compared to a U.S. release of 2.18 billion of which 1.86 billion are reported to be Alaska fish. (https://www.npafc.org/statistics/)

North Korea is not a party to the anadromous fish treaty and little is known about its salmon farming eff orts. The Fish Site in 2019 reported the country was "steadily increasing the farming of a range of aquatic species – including salmon, pollack, carp, and catfish."

But that farming, as reported by the website, appeared to be focused mainly on net pens where farmers can maintain control of their fish rather than sending them to sea and hoping for the best. The story did, however, add that "fish farms along the Taedong and its tributary the Pothong apparently released 'tens of millions' of fry into these rivers last autumn." (https://thefishsite.com/articles/could-north-korea-be-salmon-farmings-next-superpower)

Tens of millions of fry would be a drop in the bucket compared to Alaska fry releases and an August report from North Korea's, state-run Pyongyang Times this year indicates the country now appears to have turned its attention to fish farming in paddies in order "to produce fishes with less cost as compared to industrialized fish farms" (http://www.pyongyangtimes.com.kp/blog?

page=economy&subpage=production&blogid=66cd5edd2ab209059789a385) with its open-ocean farming shifting to pollack.

“This year, the Komalsan Offshore Atlantic Salmon Farm discharged hundreds of thousands of young pollack into the sea,” the newspaper reported in August. “It has introduced breeding methods suited to the biological characteristics of walleye pollack and its growth stage to raise the survival rate and fattening rate of young walleye pollack.” (http://www.pyongyangtimes.com.kp/blog?page=economy&subpage=rd&blogid=66cd5eca2ab209059789a384)

There are nowhere any indications of North Korea becoming a major player in the open-ocean farming of hatchery salmon. 38North, a website devoted to tracking the Korean economy via satellite imagery and what trickles out of official state media, indicates a focus on net-pen farming and salmon raised in grow-out tanks. (https://www.38north.org/2023/09/north-koreas-animal-protein-farming-expansion-status-and-challenges-2/)

Tillion’s effort to pin any ocean problems for salmon on the North Koreans and Russians is, however, nicely illustrative of the problem when multiple entities are involved in a zero-sum game – nobody wants to risk making a sacrifice that might benefit another. This is something of a variation on the old “tragedy of the commons.” (https://www.ecnmy.org/learn/your-economics/economic-glossary/what-is-the-tragedy-of-the-commons/?gad_source=1&gclid=CjwKCAiA6t-6BhA3EiwAltRFGPFe4C9RstOiQ6hVGAUkCvPWaq6BhD7d4kkWVRWm4JYYvkfZIA7gNxoCVMsQAvD_BwE)

And all is good for Alaska as the situation appears now.

Alaska commercial fishery managers can usually bask in the glow of record, never-before-seen numbers of salmon being caught (this year being a rate exception), even if most of the fish are humpies. And processors and commercial fishermen can still make money off “wild caught” humpies and chums marketed as if they were truly wild.

The hatcheries have made humpies a mainstay of the Sound’s regional economy, something some celebrate.

Alaska Fish News, a mouthpiece for the state’s commercial fishing industry, last year bragged that in 2022 hatcheries “provided 25 percent of (Alaska) salmon catches and value…(with) big returns for all users at no cost to the state.” (https://alaskafish.news/04/2023/ak-hatcheries-in-2022-provided-25-of-salmon-catches-and-value/)

The latter claim, however, was nothing but good, old-fashioned misinformation designed to mislead those who embrace hatcheries as an easy solution to any lack of salmon abundance.

In the “Alaska salmon fisheries enhancement annual report, 2023,” the Alaska Department of Fish and Game estimated hatcheries overall added 215,852 salmon of all species to the sport, personal-use and subsistence fisheries in 2022, but a significant number of those fish were produced by two still state-owned, state-run hatcheries, – one in Anchorage and one in Fairbanks. Those hatcheries are financed by federal, nationwide taxes on sport-fishing gear and revenues from sport-fishing license sales in Alaska, (https://www.adfg.alaska.gov/FedAidPDFs/RIR.5J.2024.05.pdf) all of which paid for by sport fishermen.

And in the state's Panhandle, where there are no state-owned, state-run hatcheries, the state in 2022 paid a privately-owned hatchery in Juneau and a still state-owned but now fishermen-run hatchery in Petersburg nearly $850,000 to raise coho and Chinook to be caught in regional sport fisheries.

(https://www.kfsk.org/2022/07/22/southeast-salmon-hatcheries-see-one-year-funding-but-no-permanent-fix/)

When the sport fishermen paid for salmon are removed from the hatchery production, it would appear only about 100,000 salmon, maybe fewer, were paid for by the PNP operators and the owners of the private Juneau hatchery set up under the state PNP law before state regulations were tightened to make it hard for just anyone to get into the Alaska version of salmon farming, or what Alaska hatchery operators and proponents prefer to call "ranching."

In the big picture of today, the industrial-scale, hatcheries paid for by average Alaskans but now run by the associations of fishermen provide almost no benefit to sport, personal-use and subsistence fisheries in the 49th state.

One hundred thousand salmon would amount to about 4 percent of a statewide harvest of approximately 2.5 million sport, personal-use and subsistence salmon. Meanwhile, it is unknown how many high-value sport salmon species – Chinook, sockeye and coho – the hatcheries might have cost Alaska sport fishermen.

Brendan Connors with the Institute of Ocean Sciences with Fisheries and Oceans Canada, along with Michael Malick from the National Marine Fisheries Service's Northwest Fisheries Science Center in Seattle, Ruggerone, Irvine and other colleagues in 2020 presented evidence that a warm ocean and "the approximately 82 million adult pink salmon (Oncorhynchus gorbuscha) produced annually from hatcheries (from 2005 to 2015) were estimated to have reduced the productivity of southern sockeye salmon by 15 percent on average**."** (https://www.nrcresearchpress.com/doi/pdf/10.1139/cjfas-2019-0422)

Sockeye are one of those high-value species. Personal-use dipnetters from the Anchorage metropolitan area, home to more than half the population of Alaska, every summer flock to the mouths of the Kenai and Kasilof rivers to catch them in personal-use, Alaskan-only dipnet fisheries.

Fish and Game reported (https://www.adfg.alaska.gov/index.cfm?adfg=PersonalUsebyAreaSouthcentralKenaiSalmon.harvest) th (https://www.adfg.alaska.gov/index.cfm?adfg=PersonalUsebyAreaSouthcentralKenaiSalmon.harvest)at (https://www.adfg.alaska.gov/index.cfm?adfg=PersonalUsebyAreaSouthcentralKenaiSalmon.harvest) last year almost 27,500 people participated (https://www.adfg.alaska.gov/index.cfm?adfg=PersonalUsebyAreaSouthcentralKenaiSalmon.harvest) in these so-called "food security" fisheries. (https://www.adfg.alaska.gov/static/home/subsistence/pdfs/food_security_whitepaper.pdf) They caught a reported 497,604 sockeye (https://www.adfg.alaska.gov/index.cfm?adfg=PersonalUsebyAreaSouthcentralKenaiSalmon.harvest), or about five times the number of all-species salmon the PNP hatcheries claimed to have provided for personal-use, sport and subsistence.

Still, whatever Alaska dipnetters and anglers might have lost to the hatcheries in terms of high-value salmon, it appears a pittance compared to what sport and commercial fishermen in Canada and the Lower 48 appear to have lost.

As Ruggerone pointed out, there are now five hatchery-origin salmon – primarily cheap-to-raise pink and chum salmon – being caught for every wild, non-pink salmon along the West Coast of North America.

But who cares? The only organization that has addressed the issue is the Seattle-area Wild Fish Conservancy. It petitioned NOAA to consider an endangered species listing for Alaska Chinook, sometimes makes noises about protecting wild salmon. (https://craigmedred.news/2024/05/23/endangered-chinook/)

But the organization hasn't exactly been banging the drum about the at-sea problem. As its website notes, it is primarily focused on the removal of dams in the Pacific Northwest, habitat loss in that rapidly growing region, controlling overfishing in the region's struggling commercial salmon fisheries, and shutting down hatcheries solely set up to produce salmon for harvest rather than for rehabilitation.

"For two decades, scientists and managers alike have identified overharvest, hatcheries, habitat loss, and dams as the four major causes of fishery collapse and barriers to salmon recovery," the organization proclaims. (https://wildfishconservancy.org/our-priorities/)

Overproduction of hatchery fish displacing wild fish on a zero-sum pasture in the North Pacific ocean? Well, that's pretty easy to overlook because Alaska with its hatcheries is a long, long way away, and the American public is now conditioned to believe that anything bad that happens to wild salmon happens in the comparatively brief time they spend in fresh water.

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