



WILD BROODSTOCK PROGRAMS

QUESTIONS ANSWERED





Since the 1800's the majority of fish hatcheries were constructed to replace lost natural production.

The first salmon hatcheries were constructed in the Pacific Northwest in the late 1800's to rebuild stocks that had been overharvested and to mitigate lost natural production. For decades hatchery managers did not fully understand or realize the potential impact of hatchery fish on wild fish populations. Their only goal was to produce as many fish as possible, and over time created fish better suited for the hatchery environment than their natural habitat.

Fortunately, a lot has been learned about hatcheries and their possible impact on wild populations, and in more recent years the focus is shifting toward producing fish as much like their natural-origin

cousins as possible. And while hatchery programs have advanced, they cannot perfectly replace lost natural production, but properly designed and implemented programs can address and mitigate many concerns.

The majority of early hatchery programs relied on returning hatchery fish for subsequent generations. Referred to as "segregated programs," this practice, when used over several generations, can have a negative effect on fish characteristics including the genetics of offspring. Conversely, "integrated programs," often called "broodstock programs," use a small portion of returning natural-origin fish as the parents of the next generation resulting in hatchery fish that closely resemble their wild cousins.

Recent evidence suggests that integrating natural-origin individuals into hatchery breeding pairs can boost natural population abundance with minimal negative fitness impacts to the wild population (Hess et al., 2012; Schroder et al., 2008). To help satisfy some of the misgivings and concerns associated with wild broodstock programs here are some frequently asked questions answered based on the latest science and evidence.



Wild fish collected for broodstock are captured in traps or with hook and line.

1 Do broodstock programs using in-basin natural-origin fish reduce concerns regarding wild genetics? Science indicates little impact on genetic structure and diversity caused by wild steelhead broodstock programs over extended periods. A study (Gow et al., 2011) of five rivers in British Columbia (BC) over a 58-year period showed negligible impact on genetics. According to the study, “No discernible impact of hatchery supplementation using native broodstock. Our temporal analysis of steelhead trout from five rivers in southwestern British Columbia that have been subject to hatchery supplementation using native broodstock found no evidence of genetic changes associated with the onset and continuation of supplementation, neither within individual populations nor in the relationships.”

Further, according to the “A review of hatchery reform science in Washington State” completed in January, 2020, “...recent empirical RRS (relative reproductive success) research has highlighted that hatchery programs employing 100% natural origin broodstock can provide demographic conservation benefits while maintaining genetic diversity with minimal or no apparent genetic fitness loss.”



Wild steelhead are gently brought to the net and placed in an aerated box for transport.

2 How are fish captured for broodstock programs? The two most common methods for catching natural origin fish for broodstock programs are angler capture programs and traps. Both methods have advantages and disadvantages with angler capture programs being popular and widely used. Scientific data suggests (Whitney et al., 2019) that angler capture programs can result in lower mortality rates than programs reliant of trap captures.



Aerated aluminum boxes in boats keep fish calm and safe for several hours.

3 Do volunteer angler capture programs result in a high mortality of wild fish? Angler capture programs are popular, and experience shows that using proper handling techniques and appropriate equipment will not result in the loss of fish. Scientific data also shows a very low mortality rate for broodstock programs. A study (Whitney et al., 2019) of fish caught and retained for a broodstock program on the South Fork of Idaho’s Clearwater River showed, “...that neither the survival of adults to spawning nor the subsequent hatchery survival of their progeny was negatively influenced by fight time and air exposure time for hatchery steelhead caught by recreational anglers for use as broodstock.” The study showed an average prespawm survival rate of approximately 97% over a three-year period.

4 Are broodstock fish killed during the spawning process? Several wild broodstock programs in Oregon rely on live spawn techniques. After spawning the fish are provided a brief recovery period in captivity before being released back into their natural environment. Evidence is mounting that there is a high survival rate of spawned fish and increasing examples of live spawned fish successfully negotiating a year in their natural environment and returning for subsequent spawning. This is true for programs on Oregon's coast as well as inland tributaries of the Columbia River.

5 Can broodstock programs increase natural-origin populations? Yes. Broodstock programs designed to increase natural origin fish are often labeled "conservation hatchery programs." A study (Berejikian et al., 2018) showed increased natural reproduction and genetic diversity after ending a steelhead conservation hatchery program. The 17 year before-after-control-impact experiment measured the effects of a captive rearing program for steelhead on a key indicator of natural spawner abundance (naturally produced nests or 'redds'). The supplemented population exhibited a significant (2.6-fold) increase in redd abundance following supplementation. Four non-supplemented (control) populations monitored over the same 17-year period exhibited stable or decreasing trends in redd abundance.



Captured wild fish are handled with great care. Mortality rates are very close to zero.

6 Are wild broodstock programs a cause of wild fish declines? Loss of essential habitat has long been viewed as the primary cause of wild salmon and steelhead declines. Recent science however, points to ocean conditions (Welch et al., 2020) as the most likely cause of coast wide declines in wild fish populations. Out of control predation is another major factor and a recent published study (Nelsen et al., 2019) concludes "wild chinook salmon productivity is negatively related to seal density and not related to hatchery releases in the Pacific Northwest." Science shows wild broodstock programs either increase natural origin abundance or have no effect.



Captured broodstock fish are transported quickly from aerated boxes to large streamside tanks or trucks.

7 Do broodstock programs increase the availability of harvestable fish? There is little question that broodstock programs designed to increase harvest opportunities are successful. British Columbia (BC) has used broodstock programs for decades and their success has been scientifically documented (Gow et al., 2011). Broodstock programs are also being used successfully in Washington, Oregon and California to provide increases in the number of harvestable salmon and steelhead.

8 Do broodstock programs increase angling pressure and impacts on wild fish? Anglers in search of salmon and steelhead will congregate where fish are abundant. Because increased popularity of rivers with successful broodstock programs some anglers and department employees have been critical of broodstock programs. To decrease angling pressure on rivers with high numbers of harvestable fish more wild broodstock programs need to be implemented to spread harvest opportunities and anglers.

With few exceptions hatchery fish can be retained while natural-origin fish must be safely released, and increased angling pressure often correlates to higher handle rates of wild fish. A recent study by Idaho Fish and Wildlife employees (Chiaromonte et al., 2018) found, “results of nearly all previous salmonid studies suggest that the air exposure and fight times reported herein would result in little to no mortality for trout and salmon in freshwater.” This is consistent with other information that shows catch-and-release encounters using proper handling and release techniques result in very low mortality of released fish.

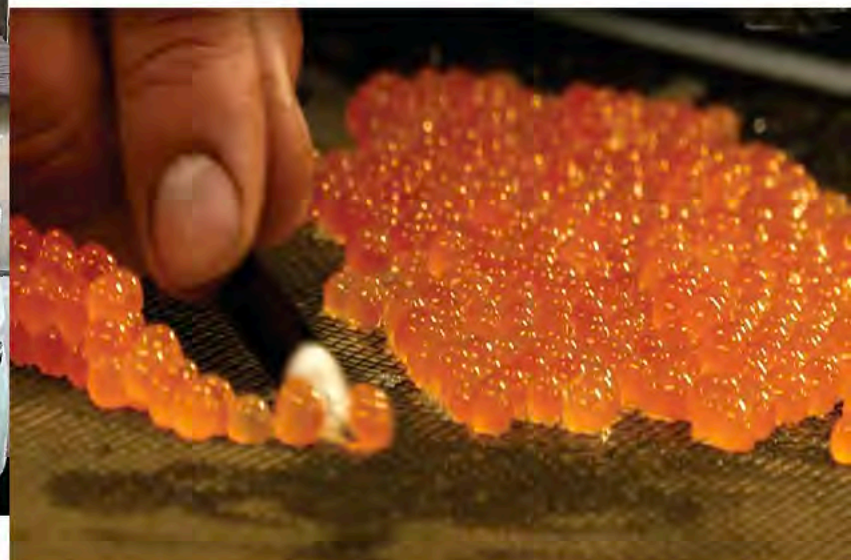
9 Is it true broodstock programs have been used successfully to recover runs on the brink of extinction? Yes. Cases of natural origin broodstock being used successfully to help recover salmon runs on the verge of extinction are increasing. One example used remnant wild Chinook in Johnson Creek, a tributary to Idaho’s Clearwater River, that initially relied on just five remaining spawning pair (10 fish). Initiated in 1998 the run remains self-sustaining today. A study (Hess et al. 2012) evaluated and substantiated the success and benefits of the program.



Hatchery personnel meticulously sort and handle harvested eggs.



Oregon north coast broodstock program pioneers Buzz Ramsey and Jack Smith look on as one of their day’s catch is carefully transferred into the hatchery holding pond



Fertilized eggs are sorted, trayed and racked.

10 Does the success of wild broodstock programs equate to a reduction in the need to protect and restore essential habitat or work to protect wild fish? Absolutely not! Responsible stewards have an obligation to ensure that agencies protect and preserve wild fish habitat. Conscientious anglers have a duty to comply with all rules and regulations, especially those intended to protect and enhance natural-origin fish. And reasonable people need to recognize that the general trend for the availability of quality freshwater habitat is decidedly in the downward direction due to inexorable pressure from human population growth (Lackey 2003), which in turn equates to increasing pressure on hatcheries to ensure abundant and healthy fisheries.

**HATCHERIES
WILL CONTINUE TO BE A
CRITICAL TOOL
IN ENSURING
WILD POPULATIONS
PERSIST AND
FISH ARE AVAILABLE FOR
HARVEST.**



Responsible hatchery programs utilizing wild broodstock, when possible, can help ensure hatchery reared fish do not compromise wild populations.

Our forefathers didn't know what they didn't know. They quickly discovered hatcheries could produce large numbers of fish. Unfortunately, they didn't fully understand the life cycle of anadromous fish or the potential impacts of simply focusing only on production. Today we have the benefit of science driven data to correct and direct how our hatcheries operate. As the data and science demonstrates wild broodstock programs are a good investment, and it is also shows now is the time to aggressively invest in research focused on further improving hatchery practices so that tomorrow's hatcheries produce fish as close to natural-origin as possible.





“A wild broodstock hatchery program”: Relies on in-basin natural origin parents for the succeeding generation of hatchery off-spring. The objective is to use 100% natural origin parents, but when necessary, a small percentage of first-generation hatchery fish may be used. Capture and rearing methods are not defining factors.

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