

Develop conservation hatchery technology to aid recovery of ESA-listed stocks of Pacific salmon

Problem Statement

Traditional salmon hatcheries may impact wild salmon populations. “Conservation hatcheries”, aimed at restoring such wild stocks to sustainable levels, must be developed.

Critical factors

- Hatcheries produce 70-80% of the salmon in coastal fisheries.
- Hatchery fish do not survive at rates as high as those of wild fish and are often ill-equipped to survive in a natural environment.
- Hatchery practices and high rates of harvest in mixed-stock fisheries that target hatchery fish have been identified as important factors contributing to the decline of wild stocks.
- Scientists are looking at ways to modify conventional hatchery practices so that hatchery fish can survive better in natural habitats.
- Accurate physiological, morphological, and behavioral measures of smolt development in hatchery and wild fish are needed.
- Agencies that operate traditional hatcheries have proposed developing “conservation hatcheries” to rebuild wild stocks to self-sustaining levels, although the idea of “conservation hatcheries” has not yet been widely accepted.



Chinook parr

Status of research

The Northwest Fisheries Science Center’s (NWFSC) Fisheries Enhancement Program is working with other agencies on a Natural Rearing Enhancement System (NATURES) in which scientists culture Pacific salmon in raceways that simulate natural environments. Salmon in these raceways grow accustomed to overhead cover, in-stream structure, substrate, and non-intrusive feed delivery systems. The fish are also trained to avoid predators. Scientists expect that this environment will produce salmon with characteristics more like those of their wild counterparts and that these fish will show increased

rates of survival after release as compared to conventional hatchery fish.

The NATURES program is comparing fall chinook salmon raised in conventional hatchery environments with fish raised in raceways with overhead cover, woody debris, and bottom substrate. Initial studies indicate that when these fish were released into streams, those raised in NATURES environments showed increased survival rates of up to 20-50% as compared to the control group raised in a traditional aquaria environment.

Scientists are also studying physiological, morphological, and behavioral measures of juvenile salmon development. Experiments are being conducted in which hatchery fish are grown in environments with water temperatures and feed rations similar to those that wild fish encounter in order to synchronize the growth cycles of hatchery fish with those of their wild counterparts.

Future considerations

Ongoing study should determine which hatchery modifications best prepare fish to thrive in a natural environment. This knowledge can be used to help develop “conservation hatcheries” and, if agencies continue to operate conventional production hatcheries, to make those hatcheries more cost-effective. Improved understanding of smoltification and development of low-cost methods for its control in hatchery fish would allow management agencies to time releases to coincide with, or avoid, critical events in the river or ocean environment.

Key Players

Resource Enhancement & Utilization Technologies (REUT) Division, NWFSC
Bonneville Power Administration
Washington Department of Fish and Wildlife
Oregon Department of Fish and Wildlife
California Department of Fish and Game



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Idaho Department of Fish and Game
Northwest Power Planning Council
Long Live the Kings
Weyerhaeuser Company
Columbia Basin Fish and Wildlife Authority
Columbia River Inter-Tribal Fish Commission
National Biological Service, U.S. Geological Survey
Oregon State University
Pacific Fishery Management Council
U.S. Army Corps of Engineers
U.S. Canada-Treaty Commission
U.S. Fish and Wildlife Service

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