

Genetics and Steelhead



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How Scientists are taught to think

Deductive Reasoning- Developing a theory and looking for information or performing experiments that Support the theory.

Inductive Reasoning- Look at all the data, finding commonality and formulating a theory.
(Francis Bacon 1637)



Mendel's Genetics

- 1800's Father of modern Genetics
- Determined that “factors” from each parent controlled the genetic makeup of any offspring.
- Some “factors” are dominate, some recessive.
- Some “factors” can skip a generation.

**If it is genetic, it is inherited
At Conception**

Learned Behavior

- **Response of an organism to stimuli or surrounding environment.**
- Response is learned for that individual.
- Response is not passed on to subsequent generations.
- Experiences in life cause conditioned responses.
- Group experiences in a hatchery may lead to group conditioned responses that appear to be a genetic change.

If you collect most of your eggs at the beginning of a run, a large number of those fish survive, you could have more fish returning early, than historical data shows. **Response or Genetic?**

Wild Horses

- Known to be domestic when introduced to the Americas.
- Are the horse roaming the sage brush near Burns Wild?
- If you break a wild horse to saddle, did the genetics of the horse change? What about any offspring?
- If you mate the wild horse to a domestic horse is the offspring no longer wild? What if you turn the offspring back to the sage with the rest of the heard? Is it a wild horse now?
- What is genetic and what is behavior?
- What is wild?



What about Humans

- The prison Model



Hatchery Steelhead and genetics

- Original brood stock came from a river
- Current brood stock comes from the river
- Non fin clipped hatchery programs has been in effect for over 50 years
- Artificially spawned, returned to the river, survives in the bay and ocean for 2-4 years, these are all wild fish
- Obtained sufficient behavioral traits to survive to adulthood.
- DNA testing has never demonstrated a difference between hatchery and non hatchery steelhead.

Research on Hatchery Fish

- Who wrote it?
- What was the hatchery practice where the paper was written
- Science evolves over time, does the research reflect modern practices?
- Advocacy?

One can always find minor issues with any process, when
Does the issue become more important than the societal
Responsibilities?

Economic impact of change is deliberately missing



Native Fish Conservation Policy 2003

- **Intent**

1. Avoid depletion of Native Fish
2. Proactive to restore and maintain native fish at levels providing ecological and social benefits
3. Foster and maintain opportunities for fisheries consistent with the conservation of naturally produced fish and responsible use of hatcheries.

Natural v Hatchery fish survival statistics

- Egg to Smolt survival for Naturally spawned fish= 1.4% (2012)
- Egg to Smolt survival for Hatchery Spawned fish= 95%
- Stream supports 500 pair NF = $500 \times 2000 \text{ eggs} = 1 \text{ million eggs} \times 1.4\% = 14,000 \text{ smolts}$
- Hatchery Spawns 500 pair $\times 2000 \text{ eggs} = 1 \text{ million eggs} \times 0.95 = 950,000 \text{ smolts}$

Adults returning to the stream

- 14,000 NF smolts x 2%-4% = 280-560 adult fish
- 950,000 HF smolts x 2%-4% = 19,000-38,000 adult fish
- If you use NF for brood stock, is the risk real or perceived?



River Steelhead catch statistics locally

• River	07-08	08-09	09-10	<u>Repro Ind.</u>
• Sixes	192	190	122	Pass
• SF Coquille	2813	2150	2992	Fail
• MF Coquille	12	10	19	Pass
• SF Coos	615	133	182	Fail



Native Fish Policy Review 2005

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.....the SF Coquille failed the reproductive criterion.

Primary reasons 1) extremely high stray rates.

2) Spawning surveys showed a hatchery fraction greater than 10%

3) Hatchery releases are present in the basin which is sufficient information for failure.....

An Advocate knows the answer and looks for evidence to support it.

A scientist asks nature how much support there is for competing Hypothesis-

Ray Hilborn- UW Fisheries Professor

A Final Thought

Change must come from the minds of men as there is no change after conception in the cells of the fish.

