Deliberative Democracy: Salmon Populations

Alignment with Course Content

This module can be used to reinforce material related to evolutionary processes such as fitness, natural selection, and population genetics.

Necessary Background Knowledge

- Evolution and natural selection
- Inbreeding depression and fitness

Policy Issue

When considering the harmful effects of salmon hatcheries on wild fish populations, you are being asked to make a policy recommendation regarding hatchery practices. Should state and federal agencies continue to supplement wild fish populations with hatchery-reared fish? If so, how much should hatchery supplementation increase or decrease? Please briefly explain the reasoning behind your policy consensus.

Module Goals

Students should be able to:

- Search and utilize published scientific data to construct an argument
- Discern between credible and less-credible resources available on the internet
- Apply the concepts that affect the evolution of populations to a regionally
- Clarify the mechanisms that cause inbreeding depression and how these mechanisms affect both large and small populations
- Address a problem with consideration of multiple variables - including scientific, social, and economic factors

Deliberation Scaffolding

Students should consider:

- What alternatives exist regarding the management of wild salmon populations?
- What is the public cost for building/maintaining salmon hatcheries?
- Are there alternative methods for increasing the genetic diversity of hatchery fish? How effective are these methods?
- What would happen to wild fish populations if hatcheries ceased operation?
- Are there any strategies that could prevent the cross-breeding of hatchery and wild salmon?

Instructor Notes

Implementation Suggestions

- If implementing in an area with a dam or fishery, be sure to ask students if they had been there or not—or if they are aware of the dams/fisheries.
- This article provides counter arguments to the potential negative effects of salmon hatcheries:

The Controversy about Salmon Hatcheries

- An article from the Oregon Business Council written in common language about the history and potential shortcomings of salmon hatcheries:

Salmon Hatcheries: Past, Present and Future

- Science in the Classroom exercises walk students through peer reviewed papers

Science in the Classroom-There's a new kid in town

Articles

Media:

New York Times 2016-To Save Its Salmon, California Calls in the Fish Matchmaker

Peer reviewed:

PLOS ONE 2014-Population Genetics and the Effects of a Severe Bottleneck in an Ex Situ Population of Critically Endangered Hawaiian Tree Snails

DOI: 10.1371/journal.pone.0114377

Informative Articles Students Might Find

Media-Debate Rages Over Hatchery vs. Wild Salmon

Media-Salmon Born in Hatcheries are Different at DNA Levels Than Wild Salmon in Hundreds of Ways

Peer Review-Techno-Arrogance and Halfway Technologies: Salmon Hatcheries on the Pacific Coast of North America

Peer Review-Sperm Competition in Salmon Hatcheries: The Need to Institutionalize Genetically Benign Spawning Protocols

Media Paper (Multiple-Choice Assignment Ideas)

New York Times 2016-To Save Its Salmon, California Calls in the Fish Matchmaker

To Save Its Salmon, California Calls in the Fish Matchmaker by Matt Richtel

Example question topics:

- The process of the "salmon mating service"
- Goals of analyzing salmon tissue samples
- Causes of salmon population decline
- Success of hatchery-reared salmon in spawning
- Evidence presented against the "salmon mating service"

Peer Reviewed Paper (Multiple-Choice Assignment Ideas)

PLOS ONE 2014-Population Genetics and the Effects of a Severe Bottleneck in an Ex Situ Population of Critically Endangered Hawaiian Tree Snails

DOI: 10.1371/journal.pone.0114377

Population Genetics and the Effects of a Severe Bottleneck in an Ex Situ Population of Critically Endangered Hawaiian Tree Snails by Melissa R. Price, and Michael G. Hadfield

Example question topics:

- How is the concept of fecundity utilized in this study?
- How was fitness measured within the study?
- Why is there a need for an ex situ breeding program for the Hawaiian tree snail?
- What factors are considered in evaluating potential success of captive breeding programs?
- Describe the main conclusion of the study

Deliberative Democracy: Salmon Populations

Leader **First & Last Name**		Facilitator/Spokesperson **First & Last Name**	
Recorder **First & Last Name**		Devil's Advocate/Summarizer **First & Last Name**	

Question to scientists: Should state and federal agencies continue to supplement wild salmon populations with hatchery-reared salmon? If so, how much should hatchery supplementation increase or decrease? If not, what other regulations need to be put into place?

What do you need to know before you can make an informed recommendation?	Why does this missing piece of information matter? (include social and science rationales)	Who will find 2-3 articles about this concept (at least one per box must be peer-reviewed)?
A.		**1.** **2.** **3.**
B.		**1.** **2.** **3.**

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What do you need to know before you can make an informed recommendation?	Why does this missing piece of information matter? (include social and science rationales)	Who will find 2-3 articles about this concept (at least one per box must be peer-reviewed)?
C.		**1.** **2.** **3.**
D.		**1.** **2.** **3.**

Before doing background research, what is your group's initial stance?

End of Day 1. Consult your textbook and find at least 2 peer-reviewed articles per question for next week.

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Question to scientists: Should state and federal agencies continue to supplement wild salmon populations with hatchery-reared salmon? If so, how much should hatchery supplementation increase or decrease? If not, what other regulations need to be put into place?

Evidence to support your science advisory statement:	Source title and journal (or media outlet) AND initials of who found the article	Which lecture topics or textbook chapters cover this material?
A.		
B.		

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C.		
D.		

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Science Advisory Statement **(Deliberate to a <u>consensus</u>):**

End of Day 2. Thank you for investing your time and energy on this activity!