

Joint Committee on Fisheries and Aquaculture

41st Annual Fisheries Forum

April 24, 2014

California State Capitol, Room 447, Sacramento

My name is Brie Lindsey, and I'm a Science and Technology Policy Fellow with the California Council on Science and Technology (CCST). CCST is committed to improving the interface between science and legislative decision-making in the State of California. The fellowship program, currently in its 5th year, is an extension of this goal, and places 10 scientists with PhDs into legislative offices for a year to provide scientific expertise and gain public policy training.

For my fellowship year, I have the privilege of being placed with the Senate Office of Research. In this role, I have provided background research on a salmon genetically engineered to grow to market size twice as quickly as conventionally-bred salmon. It is currently under review by the U.S. Food and Drug Administration as the first genetically-engineered animal intended for consumption. This year isn't the first or last time that transgenic salmon are the subject of national debate, but the recent surge in interest in this issue in California signals a good time to revisit the science. I am excited to be here today to provide the committee with some highlights of the current state of our knowledge with respect to potential ecological

impacts of transgenic salmon were they to be accidentally or intentionally released into state waters.

There are several scenarios that could occur when a transgene is introduced into a population, depending on how fit the transgenic fish is compared to wild fish. The transgene can be eliminated over time (if the transgenic fish is far less fit than the wild fish); it can be spread into the population and have various unpredictable effects (if transgenic and wild fish have similar fitness); or, in the worst case scenario, if a transgenic fish has a strong advantage (say, mating) but produces weak offspring, the wild population could crash. In order to predict which scenario might occur, we need to understand how fit transgenic salmon are.

Over a decade's worth of laboratory experiments have studied individual fitness traits in transgenic salmon in relation to wild populations. These studies have shown a wide range of consequences of growth-enhancement transgenes in salmon. Some of these would result in fitter salmon: quicker growth, more efficient use of food, earlier maturity, and faster swimming. Some would result in less fit salmon: decreased resistance to disease, riskier behaviors, higher metabolisms, and reduced reproductive performance. In addition, these transgenic salmon have been shown to have higher feeding rates and to display more aggression, sometimes leading to predation on wild salmon. Hybridizations between transgenic salmon and trout species

have occurred in the laboratory, producing offspring that are faster-growing and more aggressive than either parent fish. Any of these traits can affect the spread of transgenes and the impact on wild populations. The traits arise from interactions between genotype and environment and can vary by salmon species. Because experiments involving transgenic salmon must be carried out in contained conditions, and it is established that salmon reared under containment tend to be less hardy, it is unclear how prominent many of these traits would be in a truly natural environment. So while a good deal of progress has been made toward our understanding of transgenic salmon fitness and there is evidence that they could negatively impact wild salmon populations, the extent of their potential impact in real rivers and streams is still very much an open question.

It is my understanding that language has been added to AB 504 (introduced this session by Assemblymember Chesbro) that would prohibit hatchery production and stocking of transgenic fish in state waters. Based on my review of the literature on potential ecological impacts, I believe that a precautionary approach—as embodied in AB 504—is appropriate when considering the unknowns transgenic salmon present and the difficulty of controlling introduced species (and genes). I want to conclude by thanking the committee for continuing this forum and for allowing me to participate today.