HSWRI Aquaculture Program Research Report
**** April & May 2014 ****

Development of a Modular, Biosecure Fingerling Production Facility

For the first few weeks of their lives, marine fish larvae have a very rudimentary immune system. Because of their fragile nature, larvae are susceptible to various naturally occurring pathogens and perturbations that do not affect older individuals as dramatically. In order to compensate for this, aquaculturists employ various protocols that minimize exposure of larval fish to these disease agents and stressors. Supported by a generous donation from Norma and Paul Fruchbom, HSWRI scientists are in the process of transforming an existing larval production system into a more biosecure and environmentally controlled system at its Mission Bay Laboratory (Figure 1). All water entering the system will first pass through 1 µm membrane filtration followed by ultraviolet sterilization; this process will prevent unwanted pathogens from entering the rearing system. Once this water is treated, it will enter a recirculation system that will further remove nitrogenous and proteinaceous wastes through biofiltration and foam fractionation. Water temperature will be controllable to ± 0.5ºC around a set point that is optimized for the species being cultured. Finally, four 6,300-liter larval rearing tanks will be installed within a 780 ft^2 tension-fabric greenhouse that provides diffuse natural sunlight. The greenhouse will sit on a custom-engineered, steel-reinforced, sloped concrete floor designed to eliminate standing water from accumulating. Construction should be completed this year and operation will begin in earnest in 2015 in time for the yellowtail spawning season.

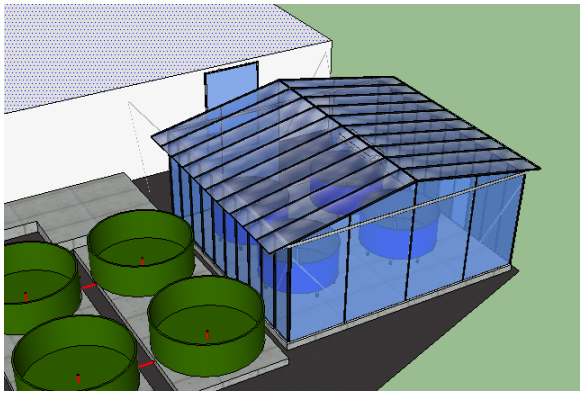

Figure 1. Schematic of new biosecure production facility on right in blue, adjacent to new broodstock nutrition research area.

Feeding Trial at Santa Catalina Island Validates Use of Soy Oil in Diets for White Seabass

In the fall of 2013, working with our research partners from Southern Illinois University, we initiated an extended feeding trial at our net pen facility in Catalina Harbor on Santa

Catalina Island. The trial was designed to validate a new, more sustainable feed formulation for white seabass (WSB) with soy oil as the primary lipid source instead of fish oil. The particular type of soy oil is hydrogenated and is high in saturated fatty acids. Our previous research[1] in a laboratory setting showed that this type of oil actually conserved the polyunsaturated fatty acids, the "healthy" lipids that fish are known for, which resulted in a fillet similar to that found in a wild fish. At Catalina we tested this diet against a control diet containing fish oil and we were pleased to see that there were no differences in growth or survival of WSB fed either diet. These data validate the effectiveness of substituting soy oil for fish oil in fish feeds making them more sustainable without sacrificing fillet quality.

Figure 2. Biologists measuring and tagging white seabass into experimental cages at Catalina Island

White Seabass Release and Recovery Update

In 2013, in collaboration with the California Department of Fish and Wildlife (CDFW) and numerous volunteers, HSWRI released 170,000 tagged juvenile WSB that were about 21 cm in length into the ocean off southern California. Since 1986, the program has released over 2 million hatchery-reared WSB. To help assess the efficacy of these replenishment efforts, field sampling is conducted each year to recover tagged fish. These fisheries-independent surveys employ variable mesh nets of small mesh size that are designed to catch juveniles. Nets are set overnight at nine different sites in southern California. In 2013 we successfully recaptured 52 hatchery-reared WSB out of a total of 198 caught for recovery rate of 26%. During October, the tag recapture rates were significantly greater than previous fall surveys and may reflect recent changes to our

Figure 3. Research assistant Dillon Howarth with a white seabass caught in the fishery-independent sampling program

[1] Jesse Trushenski , Bonnie Mulligan , David Jirsa & Mark Drawbridge (2013). Sparing Fish Oil with Soybean Oil in Feeds for White Seabass: Effects of Inclusion Rate and Soybean Oil Composition, North American Journal of Aquaculture, 75:2, 305-315

release protocols. The changes include two preferred release strategies identified by Hervas et al. (2010)[2], which were to avoid winter releases and to use net pens to acclimate the fish prior to release. We also adopted the practice of not handling the fish three weeks prior to their release (e.g. to verify counts) in order to reduce stress at the time of release. These practices collectively may reduce short-term post-release mortality thereby improving the fish's chance to recruit to the fishery.

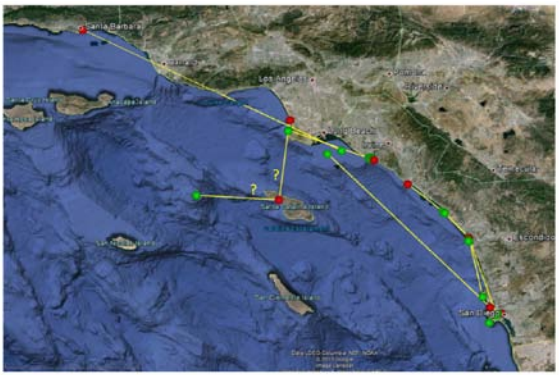

Figure 4. Release (red dot) and recapture (green dot) locations for 57 hatchery-reared WSB in 2013.

For our fisheries-dependent surveys, we scanned just over 1,900 white seabass from both the U.S. and Mexico fisheries. From these efforts, four hatchery-reared WSB were recovered or one tagged fish for every 475 scanned. The ages of these fish ranged from 8 to 10 years with lengths of 83 to 113 cm and weights of 4.5 to 11.4 kg. For all fish recaptured in 2013, the distances from their release sites ranged from < 1 to over 120 nautical miles (Figure 4). These sampling efforts will continue in 2014.

Acknowledgements

This document reports on aquaculture research projects supported by numerous grants, contracts and private contributions. It also represents the hard work of many dedicated staff and volunteers throughout southern California, as well as collaborators around the country. This information was contributed by HSWRI staff and compiled by Senior Research Scientist and HSWRI Aquaculture Program Director Mark Drawbridge.

The aquaculture research program has been active for more than 35 years at HSWRI. The primary objective of this program is to evaluate the feasibility of culturing marine organisms to replenish ocean resources through stocking, and to supply consumers with a direct source of high quality seafood through aquatic farming. Please direct any questions to Mark Drawbridge at mdrawbridge@hswri.org.

[2] Hervas, S., K. Lorenzen, M.A. Shane, and M.A. Drawbridge (2010). Quantitative assessment of a white seabass (Atractoscion nobilis) stock enhancement program in California: post-release dispersal, growth and survival. Fisheries Research 105: 237–243

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- SDG&E Environmental Champions
- SeaWorld Parks and Entertainment
- SeaWorld San Diego
- Soy Aquaculture Alliance
- The California Department of Fish and Wildlife's Ocean Resources Enhancement and Hatchery Program
- The Catalina Seabass Fund
- The Fletcher Foundation
- The Shedd Family
- The U.S. Fish and Wildlife Service's Sport Fish Restoration Account
- United Soybean Board
- USDA National Institute of Food and Agriculture
- Western Regional Aquaculture Center (WRAC)

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