

---

## HSWRI Aquaculture Program Research Report

### \*\*\* February – March 2015 \*\*\*



### **The Road to Fish Meal Replacements in Diets of Marine Fish**

As a continuation of our research funded by the United Soybean Board and in collaboration with our partners at Southern Illinois University, we ran a series of feeding trials with white seabass and yellowtail testing the effectiveness of fermented soybean meal diets versus traditional soybean and high fish meal diets. The fermentation process, done by bacteria, has been shown to improve the nutritional quality and digestibility of soybean meal for humans, livestock and several species of fish.

Surprisingly, there were no observed benefits with either white seabass or yellowtail to fermented soybean meal over traditional soybean meal. However, using fermented soybean meal allowed us to decrease the amount of fishmeal from 48% to 12% and 20% in diets for white seabass and yellowtail, respectively. It is possible that the microbial biomass associated with the fermented soybean meal had a negative effect on the nutritional properties of the meal for both species. These results were unexpected since the benefits of fermentation have been shown for other species of fish and they highlight the different nutritional requirements of various species of fish and the importance of developing feed formulations unique to each species.



**Figure 1.** HSWRI researchers subsample seabass in a feeding trial.

### **Captive Spawning of California Yellowtail – The Story Continues**

As we introduced last spring, a team of collaborators is seeking to unravel the mysteries of group spawning yellowtail held in a captive environment. USD graduate student and Sea Grant trainee, Elizabeth Smith, is in the final stages of a two-year thesis project focused on this topic. Working with geneticists at NOAA's Southwest Fisheries Science Center (SWFSC) in La Jolla, the team has successfully identified unique genetic markers among HSWRI's captive broodstock that allows them to link yellowtail offspring to their parents.

Elizabeth has used larval samples collected from all spawns occurring in 2013 and 2014 to determine which adults (among 20-30) are participating, how often, and at what capacity.

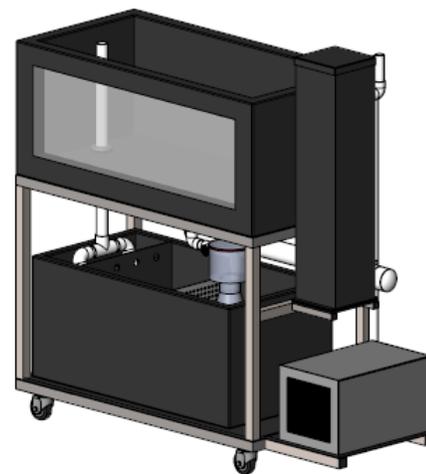
Thus far, we have found that almost every fish participates reproductively at some level but there are clearly one or two females doing the majority of work. In 2014, one female produced more than 40% of the eggs for the year - an estimated 23 million eggs! The males in the tank present a different story whereby most contribute equally to each spawn over the entire spawning season. The project is answering some interesting questions related to spawning intervals between batches from the same female, as well as the range in batch fecundity. Beyond the scope of Elizabeth's project, the research team will seek to link parental data with egg quality as we have done previously with white seabass. From an applied management perspective, the team will decide later this fall whether or not to remove the dominant female to see how the spawning dynamics and egg production levels may change.



**Figure 2.** HSWRI researchers conduct an annual health assessment of yellowtail brood fish.

## Seabass in The Classroom Program (SITC) Expands North into Los Angeles

Bolstered by recent funding from USC Sea Grant supporting a collaborative outreach and technology transfer project, HSWRI and SITC partners are expanding the popular seabass education program from its current Orange County border north into Los Angeles. SITC Program Manager, Mike Shane, and Linda Chilton of USC have identified the Port of Los Angeles High School (POLAHS) to lead the expansion. POLAHS is an independent, college preparatory charter high school located in San Pedro. In January, two teachers for the school attended an SITC teacher workshop held in San Diego. In February, Mike Shane and Michael Paquette, systems engineer with Ocean's Design, visited the school to discuss the program in more



**Figure 3.** Design of SITC tank system to be installed at POLAHS

detail and to see the classroom where the tank system would be installed. During the visit, various tank design options were discussed and a portable system was determined to be the best approach for this school (Figure 3). The system is expected to be delivered late spring with a start date for the program in the fall of 2015.

## 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](mailto:mdrawbridge@hswri.org).

Aquaculture research at HSWRI is currently supported by these major contributors:

- Avalon Tuna Club Foundation
- Cabrillo Power/NRG
- California Sea Grant
- Chevron Corporation
- Der Fruchtbaum Family Trust
- Dorothea Laub; Dick Laub Fisheries Replenishment Program
- Edison International
- Fisherman's Landing
- H & M Landing
- Joseph S. and Diane H. Steinberg 1992 Charitable Trust
- Los Angeles Rod & Reel Club Foundation
- NOAA's Saltonstall-Kennedy Program
- Point Loma Sportfishing
- Poseidon Water
- San Diego County Fish and Wildlife Advisory Commission
- Santa Monica Seafood
- SDG&E Environmental Champions
- Seaforth Sportfishing



- 
- SeaWorld Parks and Entertainment
  - SeaWorld San Diego
  - Sempra Energy Foundation
  - 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
  - USC Sea Grant
  - USDA National Institute of Food and Agriculture
  - Western Regional Aquaculture Center (WRAC)

Hubbs-SeaWorld Research Institute is a 501(c)(3) non-profit charity. If you would like to become a financial supporter of the Institute's aquaculture research, please contact HSWRI's Development Director, Eileen Sigler, at (619) 226-3881. You can also make an online donation by clicking here: [Donate Now](#).

For more information on the Institute visit [www.hswri.org](http://www.hswri.org) or become a fan at [www.facebook.com/hswri](https://www.facebook.com/hswri).